PROFINET/
Industrial Ethernet
according to IEEE 802.3

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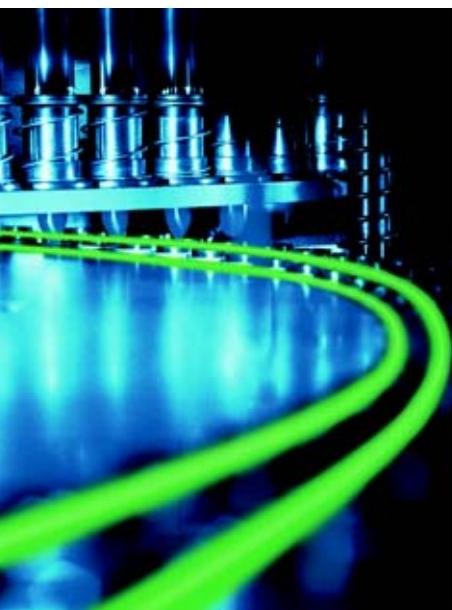
PROFINET/Industrial Ethernet
Active network components

Overview

■ **Overview**
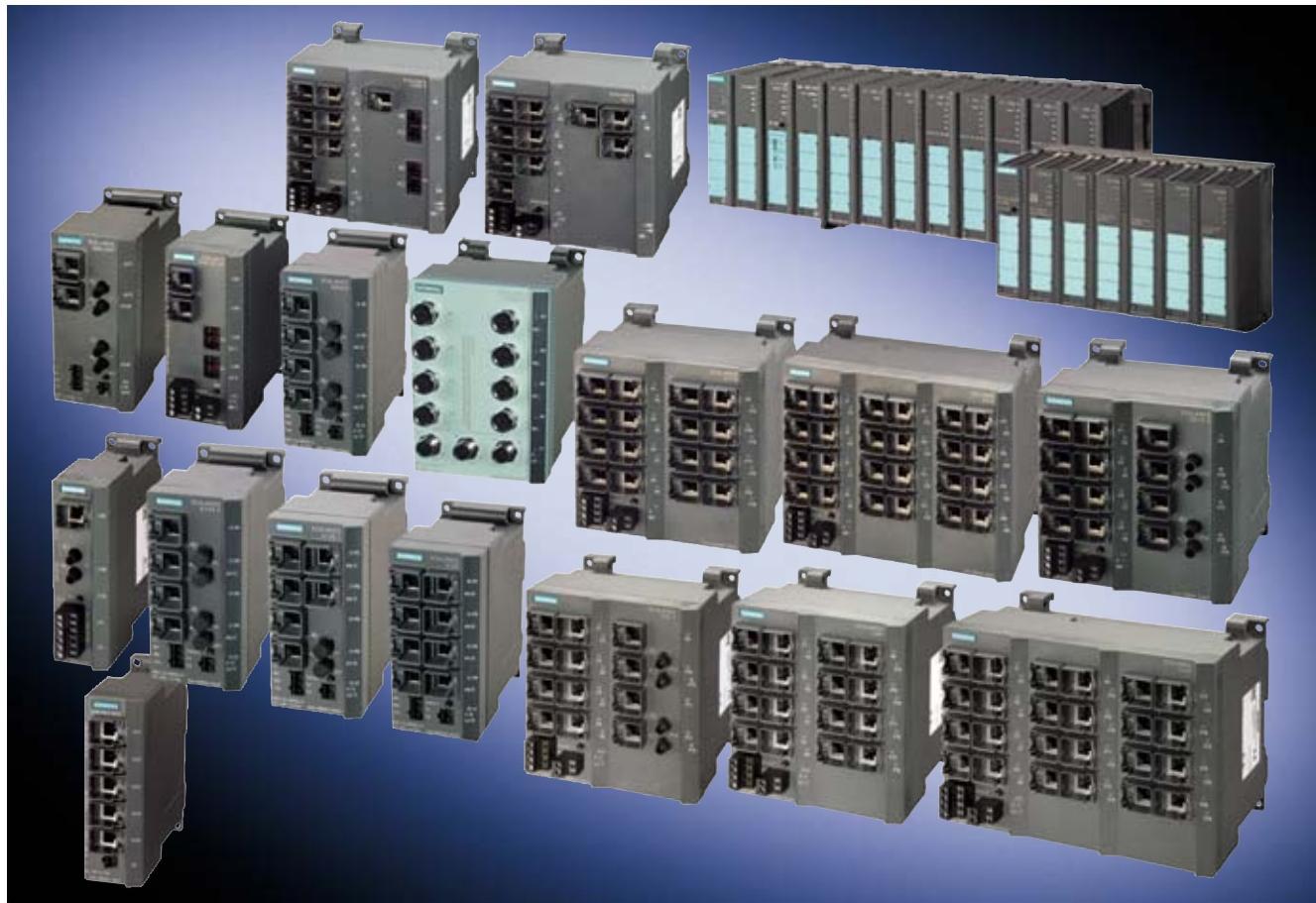
Industrial Ethernet Switches

SCALANCE X is the product range of Industrial Ethernet switches from SIMATIC NET. Switches are active network components that specifically distribute data to the relevant address-ees. The SCALANCE X product group comprises various product lines that complement each other and are carefully tuned to the specific automation task.

SCALANCE X-005 Entry Level;
unmanaged switch with five RJ45 ports and diagnostics on the device for use in machine and plant islands.

SCALANCE X-100 unmanaged;
switches with electrical and/or optical ports, redundant power supply and signaling contact for use direct at the machine.

SCALANCE X-200 managed;
universally implementable from machine-level applications to networked subsystems. Project design and remote diagnosis are integrated in the STEP 7 engineering tool. This enhances the availability of the plant. Devices with a high degree of protection support installation outside the control cabinet.
Appropriate switches (SCALANCE X-200IRT) are also available for use in subsystem networks with strict real-time and maximum availability requirements.

SCALANCE X-300 managed plus; **NEW**
the main application areas are high-performance plant networks with a connection to the enterprise network. The SCALANCE X-300 managed plus product range combines the firmware functionality of the SCALANCE X-400 product line (without the routing functions on Layer 3) with the compact design of the the SCALANCE X-200 product line. The SCALANCE X-300 Switches therefore feature extended management functions and extended firmware functionality in comparison to the SCALANCE X-200 switches.

SCALANCE X-400 modular;
for implementation in high-performance plant networks.
The modular structure allows the switches to be adapted to the specific task. Thanks to the support of standardized IT functions (e.g. VLAN, IGMP, RSTP), automation networks can be seamlessly integrated into existing office networks.
Routing functions on Layer 3 support communication between different IP subnets.

■ Overview

SCALANCE X		Real-Time	Isochronous Real-Time

Overview of the Industrial Ethernet switches

PROFINET/Industrial Ethernet
Industrial Ethernet switches

Overview

Overview (continued)

Type of module	GbE 10/100/1000 TP	GbE FO	FE 10/100 RJ45	FE 10/100 M12	100 POF/PCF	100 Multimode BFOC	100 Singlemode BFOC	Compact housing	LED diagnostics	SIMATIC environment	2 × 24 V DC	Signal contact	Local display (set button)	Diagnostics: Web, SNMP	PROFINET diagnostics	C-PLUG slot	Ring redundancy with RM	Standby redundancy	IRT capability	Gigabit technology	Modular design	Digital inputs	VLAN	RSTP	IGMP	Layer 3 switching	Family
X414-3E	2	2 4)	20 3)			12 3)	12 3)		■	■	■	■	■	■	■	■	■	■		■	■	8	■	■	■	■	X-400
X408-2	4	4 4)	4			4 1)	4 2)		■	■	■	■	■	■	■	■	■	■		■	■		■	■	■		X-400
X310	3		7					■	■	■	■	■	■	■	■	■	■	■		■			■	■	■		X-300
X308-2	1	2 5)	7					■	■	■	■	■	■	■	■	■	■	■		■			■	■	■		X-300
X308-2LD	1	2 5)	7					■	■	■	■	■	■	■	■	■	■	■		■			■	■	■		X-300
X204IRT			4					■	■	■	■	■	■	■	■	■	■	■	■								X-200
X202-2IRT			2			2		■	■	■	■	■	■	■	■	■	■	■	■								X-200
X202-2P IRT			2		2			■	■	■	■	■	■	■	■	■	■	■	■								X-200
X201-3P IRT			1		3			■	■	■	■	■	■	■	■	■	■	■	■								X-200
X200-4P IRT					4			■	■	■	■	■	■	■	■	■	■	■	■								X-200
X224			24					■	■	■	■	■	■	■	■	■	■										X-200
X216			16					■	■	■	■	■	■	■	■	■	■										X-200
X212-2			12			2		■	■	■	■	■	■	■	■	■	■										X-200
X212-2LD			12				2	■	■	■	■	■	■	■	■	■	■										X-200
X208			8					■	■	■	■	■	■	■	■	■	■										X-200
X208PRO				8				■	■	■	■	■	■	■	■	■	■										X-200
X206-1			6			1		■	■	■	■	■	■	■	■	■	■										X-200
X206-1LD			6				1	■	■	■	■	■	■	■	■	■	■										X-200
X204-2			4			2		■	■	■	■	■	■	■	■	■	■										X-200
X204-2LD			4				2	■	■	■	■	■	■	■	■	■	■										X-200
X124			24					■	■	■	■	■	■														X-100
X116			16					■	■	■	■	■	■														X-100
X112-2			12			2		■	■	■	■	■	■														X-100
X108			8					■	■	■	■	■	■														X-100
X106-1			6			1		■	■	■	■	■	■														X-100
X104-2			4			2		■	■	■	■	■	■														X-100
X005			5					■	■	■																	X005

■ well suitable

1) can be additionally plugged in via multimode media modules
2) can be additionally plugged in via singlemode media modules
1) and 2) a total of max. 2 media modules 100 MBit/sec can be plugged in
3) with extender module
4) can additionally be plugged with singlemode or multimode media modules with SC interface
5) singlemode or multimode with SC interface

G_IK10_XX_10216

Overview of the functions of the SCALANCE X Industrial Ethernet switches

■ Overview

- The unmanaged Industrial Ethernet switches of the SCALANCE X-100 product line are optimized for installing Industrial Ethernet networks with 10/100 Mbit/s in a line and star topology
- Electrical or optical connection to stations or network in accordance with the port type of the devices
- Rugged metal housing for space-saving cabinet mounting on standard rails, S7-300 DIN rail or for wall mounting
- Rugged, industry-standard station connections with PROFINET-compatible RJ45 connectors that offer additional strain relief and bending strain relief thanks to latching on the housing
- Redundant power supply
- Diagnostics on the device by means of LEDs (power, link status, data communication)
- Error signaling contact with easy adjustment using the SET button

■ Benefits

g e get   Designed for Industry

- Ideal solution for configuring Industrial Ethernet star and line topologies
- Space-saving installation in the cabinet thanks to the compact design in S7-300 format
- Secure data communication by means of industry-standard device interface using PROFINET-compliant plug-in connector (IE FC RJ45 Plug 180) and additional strain relief by latching the connector to the housing
- Installation is possible without a patch field by means of IE FC RJ45 Plug 180 and IE FC Standard Cable
- Simple and fast diagnosis via LED on device and signaling contact
- Uncrossed connecting cables can be used due to the integrated Autocrossover function
- Simple network configuration without runtime calculation

■ Application

The switches of the SCALANCE X-100 product line support the inexpensive construction of Industrial Ethernet line or star topologies with switching functions. They are designed for operation in the control cabinet.

Product versions

SCALANCE X104-2 / SCALANCE X106-1 / SCALANCE X112-2 NEW

- Construction of optical Industrial Ethernet line or star topologies:
  - SCALANCE X104-2; line or star topologies with 4 electrical ports and 2 optical ports
  - SCALANCE X106-1; star topologies with 6 electrical ports and 1 optical port
  - SCALANCE X112-2; line or star topologies with 12 electrical ports and 2 optical ports
- Diagnostics on the device using LEDs (power, link status, data traffic) and signaling contact (alarm screen form can be set using a button on the device)
- The four (SCALANCE X104-2), six (SCALANCE X106-1) or twelve (SCALANCE X112-2) RJ45 sockets are designed to be industry-compatible with additional holding collars for connection of the IE FC RJ45 Plug 180

SCALANCE X108 / SCALANCE X116 NEW */ SCALANCE X124* NEW

- Construction of electrical Industrial Ethernet star and line topologies
  - SCALANCE X108; with eight electrical ports
  - SCALANCE X116; with 16 electrical ports
  - SCALANCE X124; with 24 electrical ports
- Diagnostics on the device using LEDs (power, link status, data traffic) and signaling contact (alarm screen form can be set using a button on the device)
- The RJ45 sockets are designed to be industry-compatible with additional holding collars for connection of the IE FC RJ45 Plug 180

PROFINET/Industrial Ethernet
Industrial Ethernet switches

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SCALANCE X-100 unmanaged

■ **Design**

The SCALANCE Industrial Ethernet switches with a rugged metal housing are optimized for mounting on a standard rail and an S7-300 rail. Direct wall mounting in various positions is also possible. Due to the dimensions of the housing that conform to those of SIMATIC S7-300, the devices are optimized for integration in an automation solution with S7-300 components.

The SCALANCE X-100 switches have:

- A 4-pole terminal block for connecting the redundant supply voltage (2 x 24 V DC).
- A row of LEDs to indicate the status information (power, link status, data communication, signaling contact)
- A 2-pole terminal block for connecting the isolated signaling contact
- A SET button for on-site configuration of the signaling contact

The following port types are available:

- *10/100BaseTX, RJ45 connection;*
  RJ45 socket, automatic detection of the data rate (10 or 100 Mbit/s), with Autosensing and Autocrossover functions for connecting IE FC cables using IE FC RJ45 Plug 180 up to 100 m.
- *100BaseFX, BFOC connection technique*
  BFOC sockets for direct connection to Industrial Ethernet glass fiber-optic cables up to 3000 m for configuring line and star topologies.

■ **Function**

- Construction of electrical and optical Industrial Ethernet line or star topologies
- Use of uncrossed connecting leads is possible due to integrated auto-crossover function of the ports
- Isolation of the load due to integrated switch functions
- Easy network configuration and network expansion; no limitation of the expansion of the network when switches of the SCALANCE X-100 product line are cascaded

Network topology and network configuration

The SCALANCE X-100 switches are typically installed with the stations to be connected in a control cabinet. They can be mixed electrically and optically in star and line topologies.

When configuring the network, it is necessary to observe the following boundary conditions:

- Length of the TP cable between SCALANCE X switches:
  - max. 100 m with Industrial Ethernet FastConnect products
- Length of the fiber-optic cables:
  - max. 3000 m with Industrial Ethernet glass fiber-optic cables
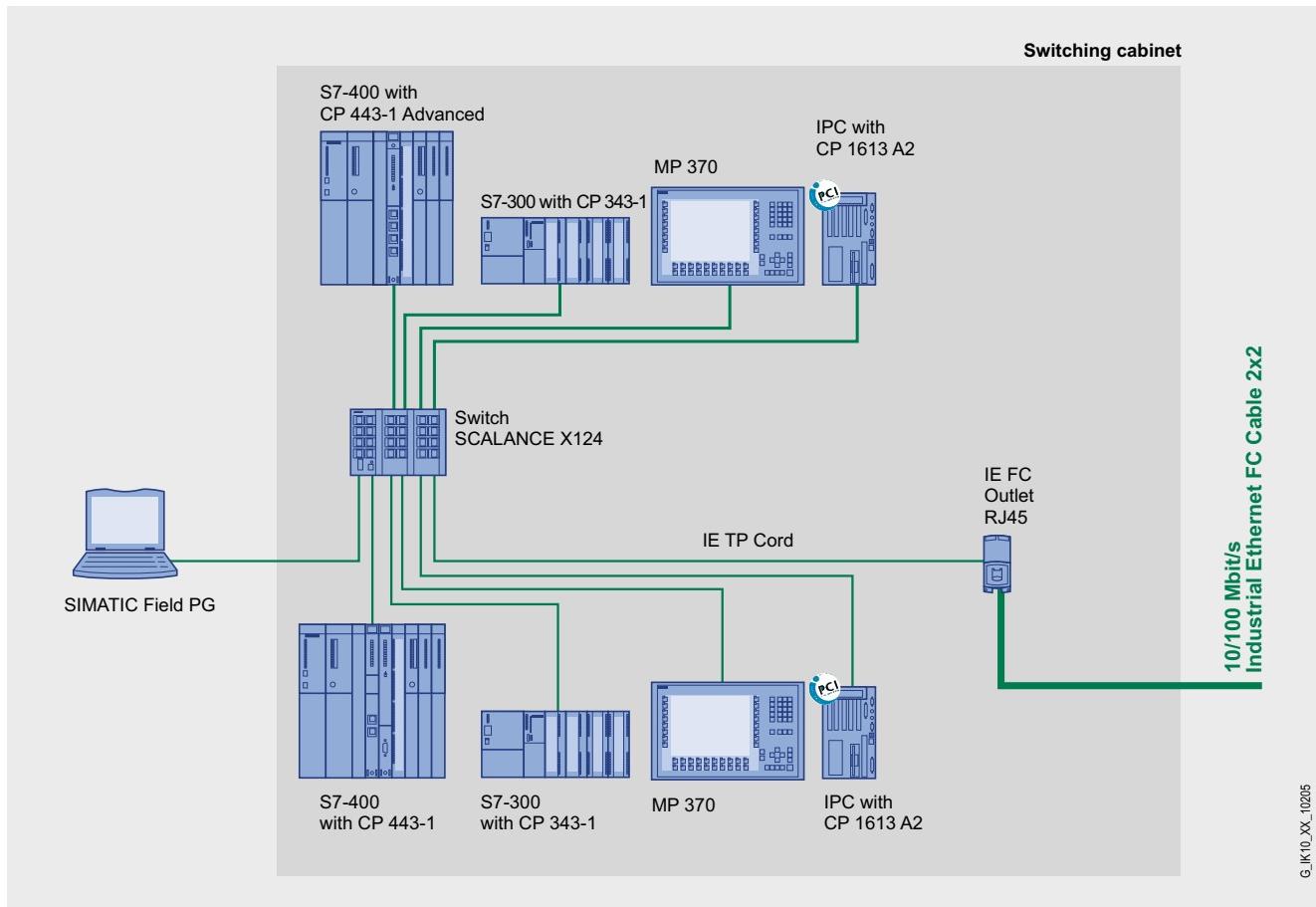
Star-shaped network topology with SCALANCE X124

Function (continued)

Electrical and optical line topology with SCALANCE X108, SCALANCE X112-2 and SCALANCE X104-2
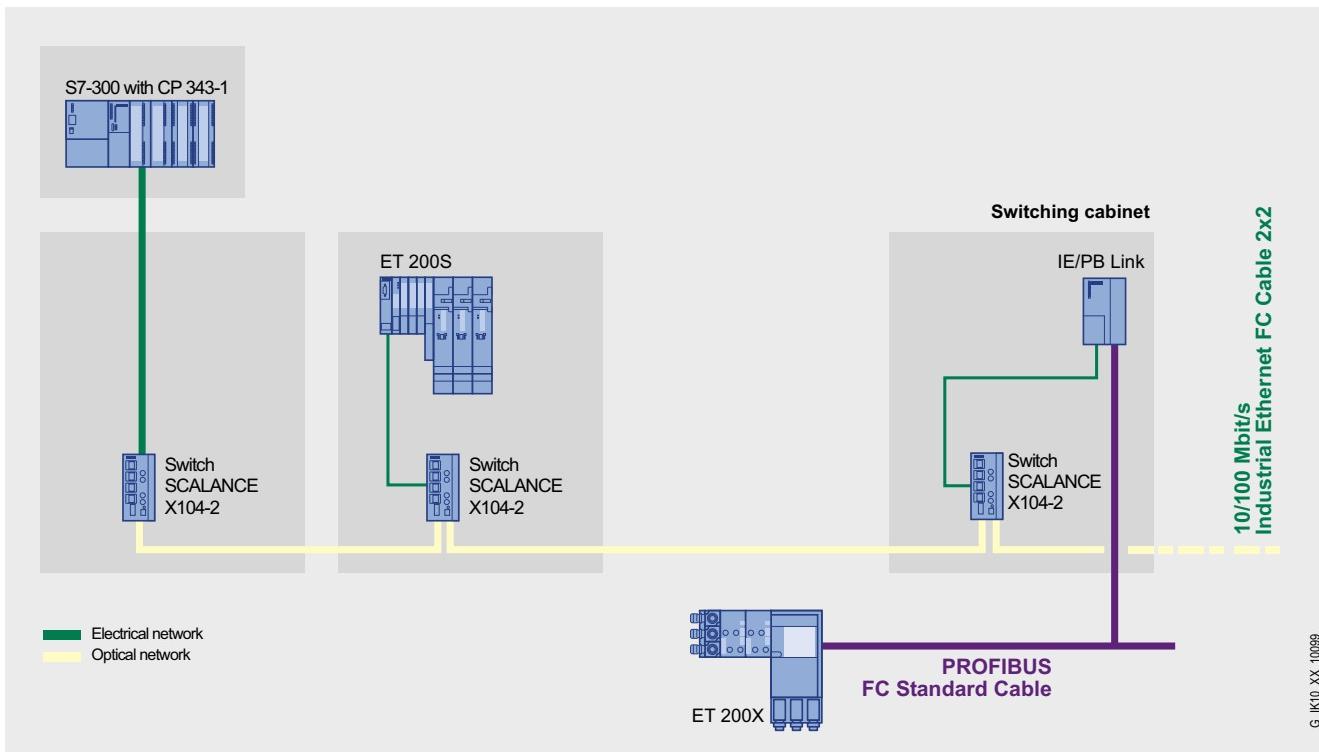
Optical line topology with SCALANCE X104-2

SCALANCE X-100 unmanaged

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■ **Function** (continued)
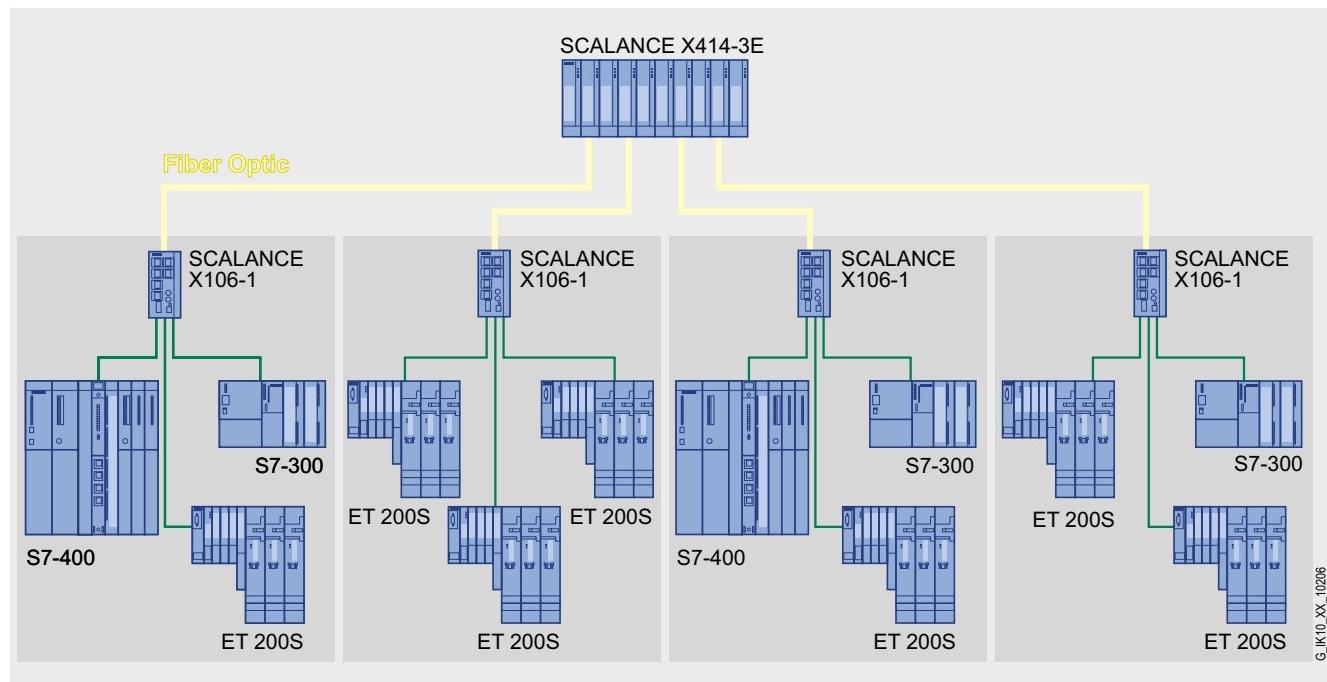
Optical star topology with SCALANCE X106-1

Diagnostics

The following information is displayed by LEDs on site:

• Power

• Port status

• Data traffic

The Industrial Ethernet switches of the SCALANCE X-100 line can also be monitored over the floating signaling contact.

PROFINET/Industrial Ethernet
Industrial Ethernet switches

SCALANCE X-100 unmanaged

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■ Technical specifications

Type	SCALANCE X104-2	SCALANCE X106-1	SCALANCE X108
Data transmission rates	10/100 Mbit/s	10/100 Mbit/s	10/100 Mbit/s
Interfaces			
• Communication connection, electrical	4 x RJ45 sockets (10/100 Mbit/s; TP)	6 x RJ45 sockets (10/100 Mbit/s; TP)	8 x RJ45 sockets (10/100 Mbit/s; TP)
• Communication connection, optical	2 x BFOC sockets (100 Mbit/s)	1 x BFOC sockets (100 Mbit/s)	–
• Connection for supply voltage	1 x 4-pole terminal block	1 x 4-pole terminal block	1 x 4-pole terminal block
• Connection for signaling contact	1 x 2-pole terminal block	1 x 2-pole terminal block	1 x 2-pole terminal block
Supply voltage	2 x 24 V DC (18 … 32 V)	2 x 24 V DC (18 … 32 V)	2 x 24 V DC (18 … 32 V)
Current consumption	160 mA	150 mA	140 mA
Power loss at 24 V DC	3.8 W	3.6 W	3.36 W
Network extension parameter / TP cable length			
• 0 … 100 m	IE FC Standard Cable with IE FC RJ45 Plug or through IE FC Outlet RJ45 with 0 … 90 m IE FC Standard Cable + 10 m TP Cord	IE FC Standard Cable with IE FC RJ45 Plug or through IE FC Outlet RJ45 with 0 … 90 m IE FC Standard Cable + 10 m TP Cord	IE FC Standard Cable with IE FC RJ45 Plug or through IE FC Outlet RJ45 with 0 … 90 m IE FC Standard Cable + 10 m TP Cord
• 0 … 85 m	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug or 0 … 75 m IE FC Marine/Trailing Cable + 10 m TP Cord	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug or 0 … 75 m IE FC Marine/Trailing Cable + 10 m TP Cord	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug or 0 … 75 m IE FC Marine/Trailing Cable + 10 m TP Cord
• 0 … 55 m	IE TP Torsion Cable with IE FC RJ45 Plug or 0 … 45 m IE TP Torsion Cable with IE FC Outlet RJ45 + 10 m TP cord	IE TP Torsion Cable with IE FC RJ45 Plug or 0 … 45 m IE TP Torsion Cable with IE FC Outlet RJ45 + 10 m TP cord	IE TP Torsion Cable with IE FC RJ45 Plug or 0 … 45 m IE TP Torsion Cable with IE FC Outlet RJ45 + 10 m TP cord
• 0 … 3000 m	Glass fiber-optic cable 62.5/125 µm or 50/125 µm; ≤ 1.0 dB/km at 1300 nm; ≥ 600 MHz x km	Glass fiber-optic cable 62.5/125 µm or 50/125 µm; ≤ 1.0 dB/km at 1300 nm; ≥ 600 MHz x km	–
Permissible ambient conditions			
• Operating temperature	-10 °C … +60 °C	-10 °C … +60 °C	-20 °C … +70 °C
• Transport/ storage temperature	-40 °C … +80 °C	-40 °C … +80 °C	-40 °C … +80 °C
• Relative humidity during operation	< 95%, non-condensing	< 95%, non-condensing	< 95%, non-condensing
Design			
• Dimensions (W x H x D) in mm	60 x 125 x 124	60 x 125 x 124	60 x 125 x 124
• Weight	780 g	780 g	780 g
• Assembly	Standard rail, S7-300 rail, wall mounting	Standard rail, S7-300 rail, wall mounting	Standard rail, S7-300 rail, wall mounting
Degree of protection	IP30	IP30	IP30
Approvals			
• Radio interference level	EN 61000-6-4	EN 61000-6-4	EN 61000-6-4
• Interference immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
• CuL listing	UL 60950-1, CSA C22.2 No. 60950-1	UL 60950-1, CSA C22.2 No. 60950-1	UL 60950-1, CSA C22.2 No. 60950-1
• FM	FM 3611	FM 3611	FM 3611
• ATEX Zone 2	EN 60079-15	EN 60079-15	EN 60079-15
• C-Tick	AS/NZS 2064 (Class A)	AS/NZS 2064 (Class A)	AS/NZS 2064 (Class A)
• CE	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
• E1	–	–	ECE-G 95/54/EG, test number 024734
Approvals for use in marine vessels	• American Bureau of Shipping • Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai	• American Bureau of Shipping • Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai	• American Bureau of Shipping • Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai

PROFINET/Industrial Ethernet
Industrial Ethernet switches

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Technical specifications (continued)

Type	SCALANCE X112-2 NEW	SCALANCE X116 NEW	SCALANCE X124 NEW
Data transmission rates	10/100 Mbit/s	10/100 Mbit/s	10/100 Mbit/s
Interfaces			
• Communication connection, electrical	12 x RJ45 sockets (10/100 Mbit/s; TP)	16 x RJ45 sockets (10/100 Mbit/s; TP)	24 x RJ45 sockets (10/100 Mbit/s; TP)
• Communication connection, optical	2 x BFOC sockets (100 Mbit/s)	–	–
• Connection for supply voltage	1 x 4-pole terminal block	1 x 4-pole terminal block	1 x 4-pole terminal block
• Connection for signaling contact	1 x 2-pole terminal block	1 x 2-pole terminal block	1 x 2-pole terminal block
Supply voltage	2 x 24 V DC (18 … 32 V)	2 x 24 V DC (18 … 32 V)	2 x 24 V DC (18 … 32 V)
Current consumption	215 mA	185 mA	200 mA
Power loss at 24 V DC	5.16 W	4.40 W	4.80 W
Network extension parameter / TP cable length			
• 0 … 100 m	IE FC Standard Cable GP with IE FC RJ45 Plug or through IE FC Outlet RJ45 with 0 … 90 m IE FC Standard Cable + 10 m TP Cord	IE FC Standard Cable GP with IE FC RJ45 Plug or through IE FC Outlet RJ45 with 0 … 90 m IE FC Standard Cable + 10 m TP Cord	IE FC Standard Cable GP with IE FC RJ45 Plug or through IE FC Outlet RJ45 with 0 … 90 m IE FC Standard Cable + 10 m TP Cord
• 0 … 85 m	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug or 0 … 75 m IE FC Marine/Trailing Cable + 10 m TP Cord	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug or 0 … 75 m IE FC Marine/Trailing Cable + 10 m TP Cord	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug or 0 … 75 m IE FC Marine/Trailing Cable + 10 m TP Cord
• 0 … 55 m	IE TP Torsion Cable with IE FC RJ45 Plug or 0 … 45 m IE TP Torsion Cable with IE FC Outlet RJ45 + 10 m TP cord	IE TP Torsion Cable with IE FC RJ45 Plug or 0 … 45 m IE TP Torsion Cable with IE FC Outlet RJ45 + 10 m TP cord	IE TP Torsion Cable with IE FC RJ45 Plug or 0 … 45 m IE TP Torsion Cable with IE FC Outlet RJ45 + 10 m TP cord
• 0 … 3000 m	Glass fiber-optic cable 62.5/125 μm or 50/125 μm; ≤ 1.0 dB/km at 1300 nm; ≥ 600 MHz x km	–	–
Permissible ambient conditions			
• Operating temperature	-10 °C … +70 °C	-20 °C … +70 °C	-20 °C … +70 °C
• Transport/ storage temperature	-40 °C … +80 °C	-40 °C … +80 °C	-40 °C … +80 °C
• Relative humidity during operation	< 95%, non-condensing	< 95%, non-condensing	< 95%, non-condensing
Design			
• Dimensions (W x H x D) in mm	120 x 125 x 124	120 x 125 x 124	180 x 125 x 124
• Weight	1100 g	1100 g	1500 g
• Assembly	Standard rail, S7-300 rail, wall mounting	Standard rail, S7-300 rail, wall mounting	Standard rail, S7-300 rail, wall mounting
Degree of protection	IP30	IP30	IP30
Approvals			
• Radio interference level	EN 61000-6-4 (industry, Class A)	EN 61000-6-3 (residential areas, Class B)	EN 61000-6-3 (residential areas, Class B)
• Interference immunity	EN 61000-6-2 (industry, Class A)	EN 61000-6-2 (industry, Class A)	EN 61000-6-2 (industry, Class A)
• CuL listing	UL 60950-1, CSA C22.2 No. 60950-1	UL 60950-1, CSA C22.2 No. 60950-1	UL 60950-1, CSA C22.2 No. 60950-1
• FM	FM 3611	FM 3611	FM 3611
• ATEX Zone 2	EN 60079-15	EN 60079-15	EN 60079-15
• C-Tick	AS/NZS 2064 (Class A)	AS/NZS 2064 (Class A)	AS/NZS 2064 (Class A)
• CE	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-3	EN 61000-6-2, EN 61000-6-3
Approvals for use in marine vessels	–	–	–

■ **Ordering data**	Order No.		Order No.

Industrial Ethernet switches SCALANCE X-100

Industrial Ethernet switches for 10/100 Mbit/s

• **SCALANCE X104-2** with four 10/100 Mbit/s RJ45 ports and two fiber-optic ports for constructing line topologies	**6GK5 104-2BB00-2AA3**
• **SCALANCE X106-1** with six 10/100 Mbit/s RJ45 ports and one fiber-optic port for constructing star topologies	**6GK5106-1BB00-2AA3**
• **SCALANCE X112-2** with twelve 10/100 Mbit/s RJ45 ports and two fiber-optic ports for constructing star topologies	**6GK5 112-2BB00-2AA3** *NEW*
• **SCALANCE X108** with eight 10/100 Mbit/s RJ45 ports for constructing star and line topologies	**6GK5 108-0BA00-2AA3**
• **SCALANCE X116** with sixteen 10/100 Mbit/s RJ45 ports for constructing star and line topologies	**6GK5 116-0BA00-2AA3** *NEW*
• **SCALANCE X124** with twenty-four 10/100 Mbit/s RJ45 ports for constructing star and line topologies	**6GK5 124-0BA00-2AA3** *NEW*

Accessories

IE FC RJ45 Plug 180

RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 180° cable outlet; for network components and CPs/CPUs with Industrial Ethernet interface

• 1 pack = 1 piece	**6GK1 901-1BB10-2AA0**
• 1 pack = 10 pieces	**6GK1 901-1BB10-2AB0**
• 1 pack = 50 pieces	**6GK1 901-1BB10-2AE0**

Manual for TP and fiber-optic networks

Paper version; network architecture, components, configurations, installation guidelines

• German	**6GK1 970-1BA10-0AA0**
• English	**6GK1 970-1BA10-0AA1**

PROFINET/Industrial Ethernet
Industrial Ethernet switches

SCALANCE X-200 managed

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■ **Overview**

- The managed Industrial Ethernet switches of the SCALANCE X-200 product line are optimized for installing Industrial Ethernet networks with 10/100 Mbit/s in a line, star and ring topology
- Integrated redundancy manager (NEW) for constructing Fast Ethernet ring topologies (excluding SCALANCE X208 PRO)
- Electrical or optical connection to stations or network in accordance with the port type of the devices
- Rugged metal housing in S7-300 format for mounting on standard rail, S7-300 standard mounting rail or for direct wall mounting in various positions
- Rugged, industry-standard station connections with PROFINET-compatible RJ45 connectors that offer additional strain relief and bending strain relief thanks to latching on the housing
- Redundant power supply
- Diagnostics on the device by means of LEDs (power, link status, data communication)
- Error signaling contact with easy adjustment using the SET button
- The devices feature PROFINET diagnostics, SNMP access, integral web server and automatic e-mail sending function for remote diagnosis and signaling over the network.

■ **Benefits**

get **Designed for Industry**

- Ideal solution for configuring Industrial Ethernet line, star and ring topologies
- Reliable data communication thanks to rugged device connection using PROFINET-compatible plug-in cables that offer additional strain relief and bending strain relief thanks to latching on the housing
- High network availability by constructing redundant ring structures (reconfiguration time < 0.3 seconds with 50 switches in the ring)
- Fast and easy diagnosis with LEDs on the device, through the integral Web server and through signaling contacts
- Integration of the SCALANCE X-200 switches in the existing network management infrastructure through SNMP access point
- Easy integration in the process diagnosis and system diagnosis with PROFINET
- Configuration and diagnostics integrated into STEP 7 provide significant benefits during the engineering, start-up and operating phases of a plant
- Uncrossed connecting cables can be used due to the integrated Autocrossover function
- Module replacement without the need for a programming device, using the C-PLUG swap medium for backing up the configuration data
- Arrangement possible without control cabinet since devices with high degree of protection IP65 are available

PROFINET/Industrial Ethernet
Industrial Ethernet switches

SCALANCE X-200 managed

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▪ Application

The SCALANCE X-200 Industrial Ethernet switches permit cost-effective configuration of Industrial Ethernet line, star or ring topologies with switching functionality for networks in which high availability or remote diagnostics options are required.
The devices with degree of protection IP30 have been designed for use in the control cabinet.
SCALANCE X208PRO, is designed to the degree of protection IP65 for installation outside the control cabinet.

Product versions

- Switches with electrical and optical ports for glass multi-mode FOC up to 3 km:
  - *SCALANCE X204-2;*
    for setting up optical line or ring topologies with 4 electrical ports and 2 optical ports
  - *SCALANCE X206-1;*
    for setting up star topologies with 6 electrical ports and 1 optical port,
    line or ring topologies with electrical and optical transmission paths
  - *SCALANCE X212-2;* **NEW**
    for constructing optical line or ring topologies with 12 electrical ports and 2 optical ports
- Switches with electrical and optical ports for glass single mode FOC up to 26 km:
  - *SCALANCE X204-2LD;*
    for constructing optical line or ring topologies with 4 electrical ports and 2 optical ports
  - *SCALANCE X206-1LD;*
    for constructing star topologies with 6 electrical ports and 1 optical port,
    line or ring topologies with electrical and optical transmission paths
  - *SCALANCE X212-2LD;* **NEW**
    for constructing optical line or ring topologies with 12 electrical ports and 2 optical ports
- Switches with electrical ports for configuring electrical Industrial Ethernet line, star or ring topologies:
  - *SCALANCE X208;*
    with 8 electrical ports for mounting in the control cabinet
  - *SCALANCE X208PRO (degree of protection IP65);*
    with 8 electrical ports especially for use outside the control cabinet (M12 connection system)
  - *SCALANCE X216;* **NEW**
    with 16 electrical ports for mounting in the control cabinet
  - *SCALANCE X224;* **NEW**
    with 24 electrical ports for mounting in the control cabinet

Features:

- Device diagnostics with LEDs (power, link status, data communication)
- Remote diagnosis is possible through signaling contact (signal mask can be set locally using buttons except with SCALANCE X208PRO), PROFINET, SNMP and web browser
- The RJ45 sockets are industry-standard and feature additional retaining collars (except for SCALANCE X208PRO), for connection to the IE FC RJ45 Plug 180
- The eight PROFINET-compatible M12 sockets of the **SCALANCE X208PRO** are designed with IP65 degree of protection for connection to the IE M12 Plug PRO or the pre-assembled IE M12 cable
- The SCALANCE X208PRO switch can be mounted on a DIN rail or S7-300 rail or direct on the equipment or machine in a space-saving, horizontal or vertical design;
  the status information can be read off regardless of the mounting position thanks to the angled LED strip.
- Power can also be supplied to the SCALANCE X208PRO from outside the control cabinet from the PS791-1PRO power supply module at 230 V AC.

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SCALANCE X-200 managed

■ **Application** (continued)
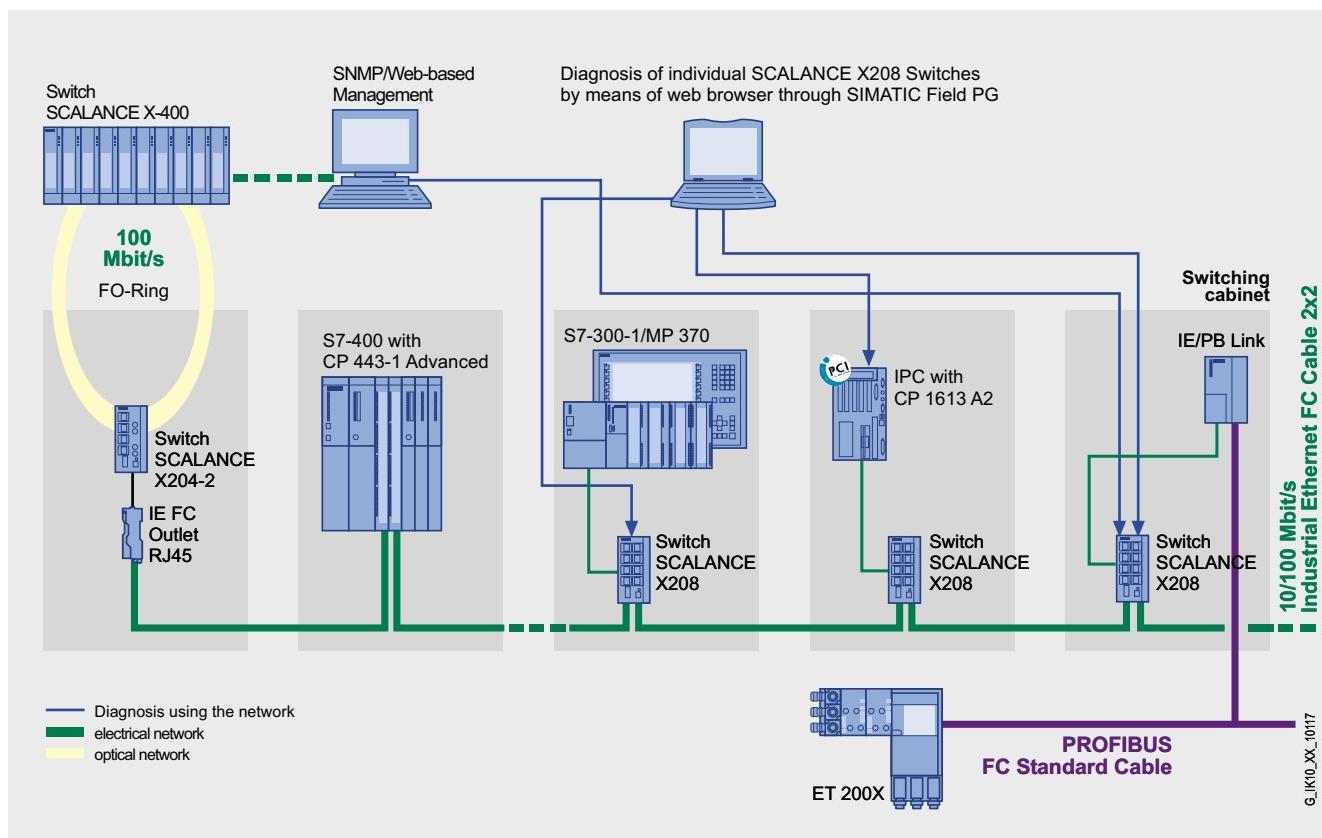
Diagnostics access over SNMP and Web browser with SCALANCE X208

■ **Design**

The SCALANCE X-200 Industrial Ethernet switches with a rugged metal housing are optimized for mounting on a standard rail and an S7-300 rail. Direct wall mounting in various positions is also possible. With the S7-300 housing format, the devices are optimized for integration in an automation solution with S7-300 components.

The switches with IP30 degree of protection feature:

- A 4-pole terminal block for connecting the redundant supply voltage (2 x 24 V DC)
- A row of LEDs to indicate the status information (power, link status, data exchange, power supply, signaling contact)
- A 2-pole terminal block for connecting the isolated signaling contact
- A SET button for on-site configuration of the signaling contact

SCALANCE X208PRO with IP65 degree of protection features:

- 2 x M12 interfaces for connecting the redundant supply voltage (2 x 24 V DC)
- A row of LEDs to indicate the status information (power, link status, data exchange, power supply, signaling contact, redundancy manager function (excluding SCALANCE X208 PRO))
- An M12 interface for connecting the isolated signaling contact

The SCALANCE X-200 switches are available with the following port types:

- *10/100BaseTX, RJ45 or M12 connection;*
  RJ45 or M12 socket, automatic detection of the data rate (10 or 100 Mbit/s), with Autosensing and Autocrossover functions for connecting IE FC cables using IE FC RJ45 Plug 180 or IE M12 Plug PRO up to 100 m.

- *100BaseFX, BFOC connection technique;*
  BFOC sockets for direct connection to Industrial Ethernet glass fiber-optic cables up to 3 km (multi-mode FOC) or up to 26 km (single mode FOC) for configuring line, ring and star topologies.

■ Function

- Configuring electrical and optical Industrial Ethernet line, star and ring topologies
- Fast redundancy in the ring with High Speed Redundancy (HSR); up to 0.3 seconds for reconfiguration of the ring with 50 switches in the ring
- The functioning of the ring is continuously monitored by the integrated redundancy manager (NEW)
  (with the exception of SCALANCE X208 PRO). It recognizes failure of a transmission path in the ring or failure of a SCALANCE X-200 and activates the substitute path within 0.3 seconds
- Use in ring topologies (100 Mbit/s) together with SCALANCE X-400, SCALANCE X-300, SCALANCE X-200IRT or OSM
- Uncrossed connecting cables can be used due to Autocrossover function integrated in the ports
- Load disconnection through integral switch functionality
- Easy diagnostics using signaling contact, SNMP and Web browser
- Easy copper cable diagnostics with Web browser for localizing cable breaks
- Integration into the diagnostics of a PROFINET IO controller with expanded diagnostics functions for a consistent diagnostics concept, including network infrastructure
- Diagnosis of data traffic by means of a parameterizable mirror port with a standard commercial network analyzer
- Optimized support of PROFINET real-time communication (RT) through prioritizing
- Fast device replacement in the event of a fault by using the optional C-PLUG swap medium (not included in scope of supply)

Network topology and network configuration

The Industrial Ethernet SCALANCE X-200 switches with IP30 degree of protection are usually installed in a control cabinet together with the stations to be connected. Electrical and optical versions can be installed together in star, line and ring topologies. The SCALANCE X208PRO is designed for installation outside the control cabinet.

When configuring the network, it is necessary to observe the following boundary conditions:

- Length of the TP cable between two SCALANCE X switches:
  - Max. 100 m with IE FC cable and IE FC RJ45 Plug 180 or IE M12 Plug PRO
  - Max. 10 m using patches with TP cord
- Length of the optical cables
  - Max. 3000 m with Industrial Ethernet glass fiber optic cables (multi-mode).
  - Max. 26000 m with Industrial Ethernet glass fiber optic cables (single mode).
- IP Address:
  The IP address is assigned by means of the DHCP (Dynamic Host Configuration Protocol). If an appropriate server is not available in the network, the IP address can be assigned using the supplied software tool. The SCALANCE X-200IRT switches and their real-time functions are configured with STEP 7.

SCALANCE X-200 managed

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■ **Function** (continued)
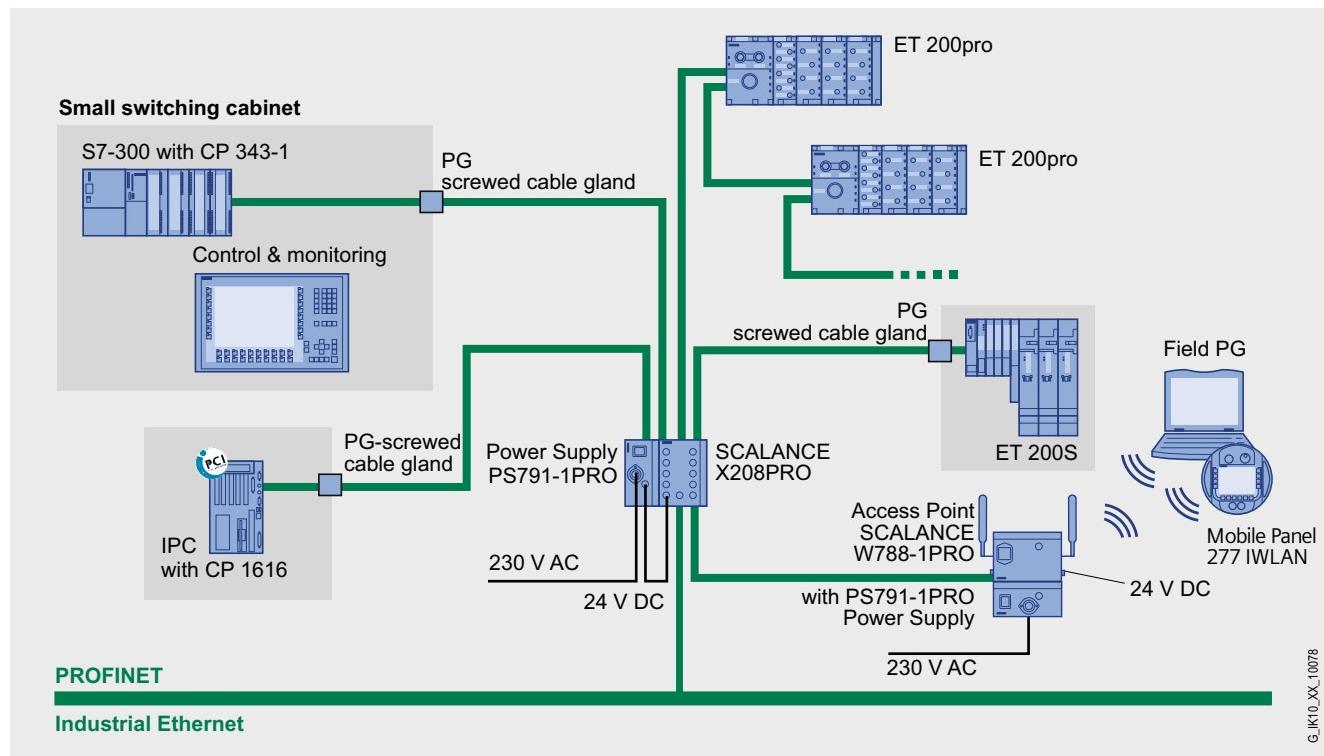
Star network topology with SCALANCE X208PRO outside the control cabinet and 230 V AC power supply
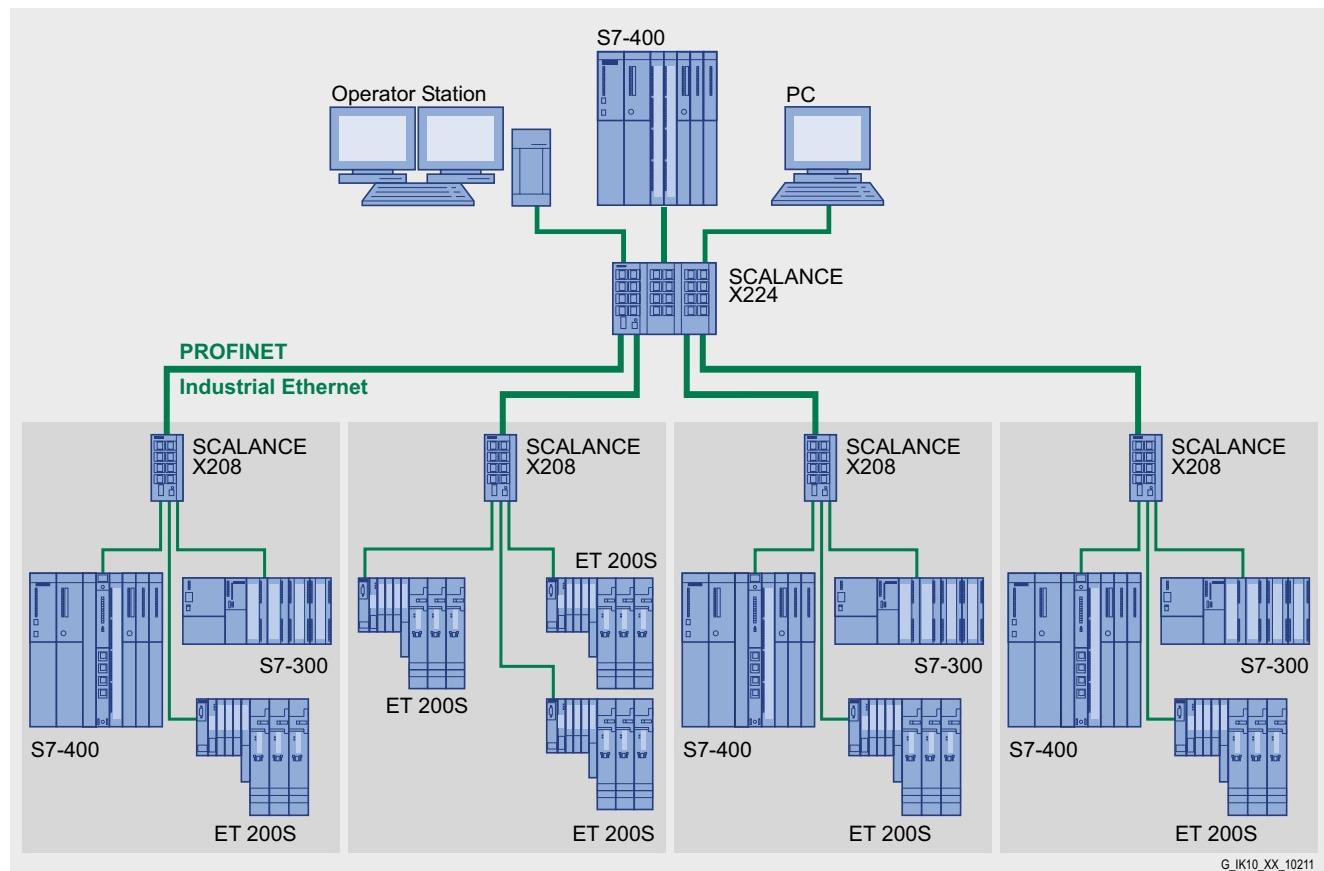
Star topology with SCALANCE X224

■ **Function** (continued)
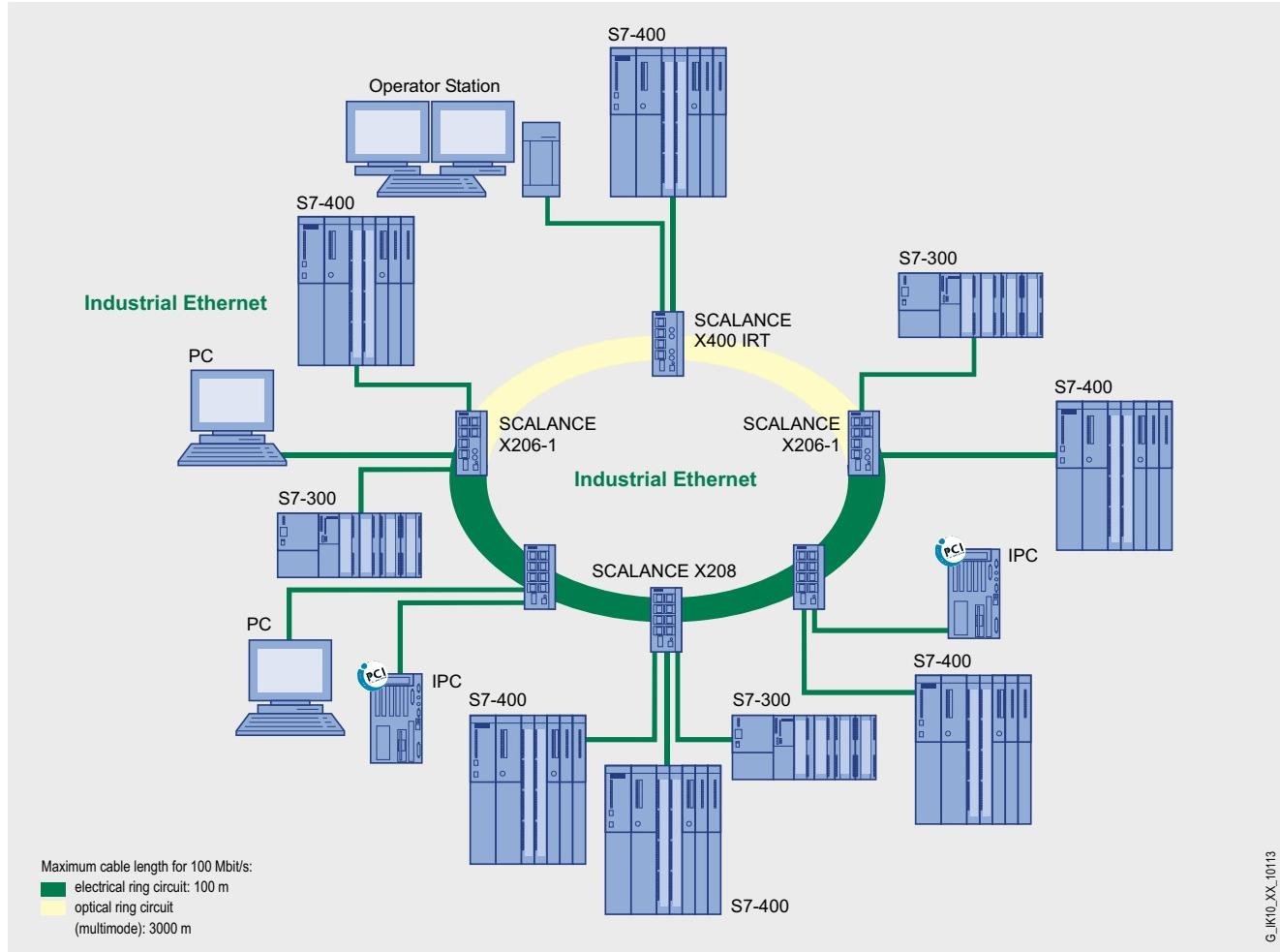
High-speed redundancy in mixed ring with fiber-optic and twisted-pair cables

Commissioning and diagnosis

PROFINET diagnostics alarms from SCALANCE X can be displayed with the appropriate SIMATIC Engineering Tools and processed in the controller with expanded diagnostics functions. The engineering outlay for the PLC and HMI have been drastically reduced through complete integration in the SIMATIC concept for system error messages.

The SCALANCE X-200 Industrial Ethernet switches can also be integrated into a network management system through the standardized protocol SNMP (Simple Network Management Protocol). In the event of a fault in the device, error messages (SNMP traps) can be sent to a network system or as e-mail to a specified network manager.

The integral Web server enables configuration and diagnostics settings to be made using a standard browser (e.g. port configuration). Statistical information can also be read out over the Web server (e.g. port capacity utilization).

PROFINET IO diagnostic alarms of SCALANCE X-200 switches can be displayed using the relevant SIMATIC Engineering Tools or also processed in the PLC. The engineering outlay is drastically reduced for the PLC and HMI through complete integration into the SIMATIC SFM system error signaling concept.

The following information is displayed on site by LEDs:
- Power
- Port status
- Data traffic
- Signaling contact
- Redundancy manager function
  (excluding SCALANCE X208 PRO)

The Industrial Ethernet switches of the SCALANCE X-200 line can also be monitored using the floating signaling contact.

PROFINET/Industrial Ethernet
Industrial Ethernet switches

SCALANCE X-200 managed

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■ Technical specifications

Type	SCALANCE X204-2	SCALANCE X204-2LD
Data transmission rate	10/100 Mbit/s	10/100 Mbit/s
Interfaces		
• Communication connection, electrical	4 x RJ45 (10/100 Mbit/s; TP)	4 x RJ45 (10/100 Mbit/s; TP)
• Communication connection, optical	2 x BFOC sockets (100 Mbit/s)	2 x BFOC sockets (100 Mbit/s)
• Connection for supply voltage	1 x 4-pole terminal block	1 x 4-pole terminal block
• Connection for signaling contact	1 x 2-pole terminal block	1 x 2-pole terminal block
• Slot for the swap medium	C-PLUG	C-PLUG
Supply voltage	2 x 24 V DC (18 V to 32 V)	2 x 24 V DC (18 V to 32 V)
Current consumption	215 mA	215 mA
Power loss at 24 V DC	5.16 W	5.16 W
Network extension parameter / TP cable length		
• 0 … 100 m	IE FC Standard Cable GP with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Standard Cable GP (0 … 90 m) + 10 m TP Cord	IE FC Standard Cable GP with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Standard Cable GP (0 … 90 m) + 10 m TP Cord
• 0 … 85 m	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Marine/Trailing/Flexible Cable (0 … 75 m) + 10 m TP Cord	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Marine/Trailing/Flexible Cable (0 … 75 m) + 10 m TP Cord
• 0 … 55 m	IE TP Torsion Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE TP Torsion Cable (0 … 45 m) + 10 m TP Cord	IE TP Torsion Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE TP Torsion Cable (0 … 45 m) + 10 m TP Cord
• 0 … 3000 m	Glass fiber-optic cable 62.5/125 µm or 50/125 µm; ≤ 1.0 dB/km at 1300 nm; ≥ 600 MHz x km	–
• 0 … 26000 m	–	Glass fiber-optic cable or 9/125 µm single-mode fiber; 0.5 dB/km at 1300 nm
Permissible ambient conditions		
• Operating temperature	-10 °C … +60 °C	0 °C … +60 °C
• Transport/storage temperature	-40 °C … +80 °C	-40 °C … +80 °C
• Relative humidity during operation	< 95%, non-condensing	< 95%, non-condensing
Design		
• Dimensions (W x H x D) in mm	60 x 125 x 124	60 x 125 x 124
• Weight	780 g	780 g
• Assembly	Standard rail, S7-300 rail, wall mounting	Standard rail, S7-300 rail, wall mounting
Degree of protection	IP30	IP30
Approvals		
• Radio interference level	EN 61000-6-4 Class A	EN 61000-6-4 Class A
• Interference immunity	EN 61000-6-2	EN 61000-6-2
• CuL listing	UL 60950-1, CSA C22.2 No. 60950-1	UL 60950-1, CSA C22.2 No. 60950-1
• FM	FM 3611	FM 3611
• ATEX Zone 2	EN 50021	EN 50021
• C-Tick	AS/NZS 2064 (Class A)	AS/NZS 2064 (Class A)
• CE	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
Approvals for use in marine vessels	• Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai • Bureau Veritas	• Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai • Bureau Veritas

■ Technical specifications (continued)

Type	SCALANCE X206-1	SCALANCE X206-1LD
Data transmission rate	10/100 Mbit/s	10/100 Mbit/s
Interfaces		
• Communication connection, electrical	6 x RJ45 (10/100 Mbit/s; TP)	6 x RJ45 (10/100 Mbit/s; TP)
• Communication connection, optical	1 x BFOC sockets (100 Mbit/s)	1 x BFOC sockets (100 Mbit/s)
• Connection for supply voltage	1 x 4-pole terminal block	1 x 4-pole terminal block
• Connection for signaling contact	1 x 2-pole terminal block	1 x 2-pole terminal block
• Slot for the swap medium	C-PLUG	C-PLUG
Supply voltage	2 x 24 V DC (18 V to 32 V)	2 x 24 V DC (18 V to 32 V)
Current consumption	200 mA	200 mA
Power loss at 24 V DC	4.8 W	4.8 W
Network extension parameter / TP cable length		
• 0 … 100 m	IE FC Standard Cable GP with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Standard Cable GP (0 … 90 m) + 10 m TP Cord	IE FC Standard Cable GP with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Standard Cable GP (0 … 90 m) + 10 m TP Cord
• 0 … 85 m	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Marine/Trailing/Flexible Cable (0 … 75 m) + 10 m TP Cord	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Marine/Trailing/Flexible Cable (0 … 75 m) + 10 m TP Cord
• 0 … 55 m	IE TP Torsion Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE TP Torsion Cable (0 … 45 m) + 10 m TP Cord	IE TP Torsion Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE TP Torsion Cable (0 …. 45 m) + 10 m TP Cord
• 0 … 3000 m	Glass fiber-optic cable 62.5/125 µm or 50/125 µm; ≤ 1.0 dB/km at 1300 nm; ≥ 600 MHz x km	–
• 0 … 26000 m	–	Glass fiber-optic cable or 9/125 µm single-mode fiber; 0.5 dB/km at 1300 nm
Permissible ambient conditions		
• Operating temperature	-10 °C … +60 °C	0 °C … +60 °C
• Transport/storage temperature	-40 °C … +80 °C	-40 °C … +80 °C
• Relative humidity during operation	< 95%, non-condensing	< 95%, non-condensing
Design		
• Dimensions (W x H x D) in mm	60 x 125 x 124	60 x 125 x 124
• Weight	780 g	780 g
• Assembly	Standard rail, S7-300 rail, wall mounting	Standard rail, S7-300 rail, wall mounting
Degree of protection	IP30	IP30
Approvals		
• Radio interference level	EN 61000-6-4 Class A	EN 61000-6-4 Class A
• Interference immunity	EN 61000-6-2	EN 61000-6-2
• CuL listing	UL 60950-1, CSA C22.2 No. 60950-1	UL 60950-1, CSA C22.2 No. 60950-1
• FM	FM 3611	FM 3611
• ATEX Zone 2	EN 50021	EN 50021
• C-Tick	AS/NZS 2064 (Class A)	AS/NZS 2064 (Class A)
• CE	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
Approvals for use in marine vessels	• Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai • Bureau Veritas	• Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai • Bureau Veritas

PROFINET/Industrial Ethernet
Industrial Ethernet switches

SCALANCE X-200 managed

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■ **Technical specifications** (continued)

Type	SCALANCE X212-2 NEW	SCALANCE X212-2LD NEW
Data transmission rate	10/100 Mbit/s	10/100 Mbit/s
Interfaces		
• Communication connection, electrical	12 x RJ45 (10/100 Mbit/s; TP)	12 x RJ45 (10/100 Mbit/s; TP)
• Communication connection, optical	2 x BFOC sockets (100 Mbit/s)	2 x BFOC sockets (100 Mbit/s)
• Connection for supply voltage	1 x 4-pole terminal block	1 x 4-pole terminal block
• Connection for signaling contact	1 x 2-pole terminal block	1 x 2-pole terminal block
• Slot for the swap medium	C-PLUG	C-PLUG
Supply voltage	2 x 24 V DC (18 … 32 V)	2 x 24 V DC (18 … 32 V)
Current consumption	330 mA	330 mA
Power loss at 24 V DC	7.92 W	7.92 W
Network extension parameter / TP cable length		
• 0 … 100 m	IE FC Standard Cable GP with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Standard Cable GP (0 … 90 m) + 10 m TP Cord	IE FC Standard Cable GP with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Standard Cable GP (0 … 90 m) + 10 m TP Cord
• 0 … 85 m	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Marine/Trailing/Flexible Cable (0 … 75 m) + 10 m TP Cord	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Marine/Trailing/Flexible Cable (0 … 75 m) + 10 m TP Cord
• 0 … 55 m	IE TP Torsion Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE TP Torsion Cable (0 … 45 m) + 10 m TP Cord	IE TP Torsion Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE TP Torsion Cable (0 … 45 m) + 10 m TP Cord
• 0 … 3000 m	Glass fiber-optic cable 62.5/125 μm or 50/125 μm; ≤ 1.0 dB/km at 1300 nm; ≥ 600 MHz x km	–
• 0 … 26000 m	–	Glass fiber-optic cable or 9/125 μm single-mode fiber; 0.5 dB/km at 1300 nm
Permissible ambient conditions		
• Operating temperature	0 °C … +60 °C	0 °C … +60 °C
• Transport/storage temperature	-40 °C … +80 °C	-40 °C … +80 °C
• Relative humidity during operation	< 95%, non-condensing	< 95%, non-condensing
Design		
• Dimensions (W x H x D) in mm	120 x 125 x 124	120 x 125 x 124
• Weight	1200 g	1200 g
• Assembly	Standard rail, S7-300 rail, wall mounting	Standard rail, S7-300 rail, wall mounting
Degree of protection	IP30	IP30
Approvals		
• Radio interference level	EN 61000-6-4 Class A	EN 61000-6-4 Class A
• Interference immunity	EN 61000-6-2	EN 61000-6-2
• CuL listing	UL 60950-1, CSA C22.2 No. 60950-1	UL 60950-1, CSA C22.2 No. 60950-1
• FM	FM 3611	FM 3611
• ATEX Zone 2	EN 50021	EN 50021
• C-Tick	AS/NZS 2064 (Class A)	AS/NZS 2064 (Class A)
• CE	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
Approvals for use in marine vessels	• Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai • Bureau Veritas	• Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai • Bureau Veritas

■ **Technical specifications** (continued)

Type	SCALANCE X208	SCALANCE X208PRO
Data transmission rate	10/100 Mbit/s	10/100 Mbit/s
Interfaces		
• Communication connection, electrical	8 x RJ45 (10/100 Mbit/s; TP)	8 x 4-pole M12 sockets (10/100 Mbit/s; D-coded)
• Communication connection, optical	–	–
• Connection for supply voltage	1 x 4-pole terminal block	2 x 4-pole M12 interface
• Connection for signaling contact	1 x 2-pole terminal block	1 x 5-pole M12 interface
• Slot for the swap medium	C-PLUG	C-PLUG
Supply voltage	2 x 24 V DC (18 V … 32 V)	2 x 24 V DC (18 V … 32 V)
Current consumption	185 mA	185 mA
Power loss at 24 V DC	4 W	4 W
Network extension parameter / TP cable length		
• 0 … 100 m	IE FC Standard Cable GP with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Standard Cable (0 … 90 m) + 10 m TP Cord	IE FC Standard Cable GP with IE M12 Plug PRO –
• 0 … 85 m	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Marine/Trailing/Flexible Cable (0 … 75 m) + 10 m TP Cord	IE FC Marine/Trailing/Flexible Cable with IE M12 Plug PRO –
• 0 … 55 m	IE TP Torsion Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE TP Torsion Cable (0 … 45 m) + 10 m TP Cord	IE FC Torsion Cable with IE FC RJ45 Plug –
• 0 … 3000 m	–	–
Permissible ambient conditions		
• Operating temperature	-20 °C … +70 °C	-20 °C … +70 °C
• Transport/storage temperature	-40 °C … +80 °C	-40 °C … +80 °C
• Relative humidity during operation	< 95%, non-condensing	< 100%, non-condensing
Design		
• Dimensions (W x H x D) in mm	60 x 125 x 124	90 x 125 x 124
• Weight	780 g	1000 g
• Assembly	Standard rail, S7-300 rail, wall mounting	Standard rail, S7-300 rail, wall mounting
Degree of protection	IP30	IP65
Approvals		
• Radio interference level	EN 61000-6-4 Class A	EN 61000-6-4 Class A
• Interference immunity	EN 61000-6-2	EN 61000-6-2
• CuL listing	UL 60950-1, CSA C22.2 No. 60950-1	UL 60950-1, CSA C22.2 No. 60950-1
• FM	FM 3611	FM 3611
• ATEX Zone 2	EN 50021	EN 50021
• C-Tick	AS/NZS 2064 (Class A)	AS/NZS 2064 (Class A)
• CE	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
Approvals for use in marine vessels	• Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai • American Bureau of Shipping • Bureau Veritas	• Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai • American Bureau of Shipping • Bureau Veritas

SCALANCE X-200 managed

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■ **Technical specifications** (continued)

Type	SCALANCE X216 NEW	SCALANCE X224 NEW
Data transmission rate	10/100 Mbit/s	10/100 Mbit/s
Interfaces		
• Communication connection, electrical	16 x RJ45 (10/100 Mbit/s; TP)	24 x RJ45 (10/100 Mbit/s; TP)
• Communication connection, optical	–	–
• Connection for supply voltage	1 x 4-pole terminal block	1 x 4-pole terminal block
• Connection for signaling contact	1 x 2-pole terminal block	1 x 2-pole terminal block
• Slot for the swap medium	C-PLUG	C-PLUG
Supply voltage	2 x 24 V DC (18 V … 32 V)	2 x 24 V DC (18 V … 32 V)
Current consumption	240 mA	350 mA
Power loss at 24 V DC	5.76 W	8.40 W
Network extension parameter / TP cable length		
• 0 … 100 m	IE FC Standard Cable GP with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Standard Cable (0 … 90 m) + 10 m TP Cord	IE FC Standard Cable GP with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Standard Cable (0 … 90 m) + 10 m TP Cord
• 0 … 85 m	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Marine/Trailing/Flexible Cable (0 … 75 m) + 10 m TP Cord	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Marine/Trailing/Flexible Cable (0 … 75 m) + 10 m TP Cord
• 0 … 55 m	IE TP Torsion Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE TP Torsion Cable (0 … 45 m) + 10 m TP Cord	IE TP Torsion Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE TP Torsion Cable (0 … 45 m) + 10 m TP Cord
• 0 … 3000 m	–	–
Permissible ambient conditions		
• Operating temperature	0 °C … +60 °C	0 °C … +60 °C
• Transport/storage temperature	-40 °C … +80 °C	-40 °C … +80 °C
• Relative humidity during operation	< 95%, non-condensing	< 95%, non-condensing
Design		
• Dimensions (W x H x D) in mm	120 x 125 x 124	180 x 125 x 124
• Weight	1200 g	1600 g
• Assembly	Standard rail, S7-300 rail, wall mounting	Standard rail, S7-300 rail, wall mounting
Degree of protection	IP30	IP30
Approvals		
• Radio interference level	EN 61000-6-4 Class A	EN 61000-6-4 Class A
• Interference immunity	EN 61000-6-2	EN 61000-6-2
• CuL listing	UL 60950-1, CSA C22.2 No. 60950-1	UL 60950-1, CSA C22.2 No. 60950-1
• FM	FM 3611	FM 3611
• ATEX Zone 2	EN 50021	EN 50021
• C-Tick	AS/NZS 2064 (Class A)	AS/NZS 2064 (Class A)
• CE	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
Approvals for use in marine vessels	• Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai • American Bureau of Shipping • Bureau Veritas	• Lloyds Register of Shipping • Det Norske Veritas • German Lloyd • Nippon Kaiji Kyokai • American Bureau of Shipping • Bureau Veritas

Ordering data	Order No.		Order No.

Industrial Ethernet Switches SCALANCE X-200

Industrial Ethernet switches with integral SNMP access, online diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; with integrated redundancy manager (NEW) (exception: SCALANCE X208PRO)

- With electrical and optical ports for glass multi-mode FOC up to max. 3 km
  - **SCALANCE X204-2** — 6GK5 204-2BB10-2AA3
    with four 10/100 Mbit/s RJ45 ports and two fiber-optic ports
  - **SCALANCE X206-1**; — 6GK5 206-1BB10-2AA3
    with six 10/100 Mbit/s RJ45 ports and one fiber-optic port
  - **SCALANCE X212-2** — 6GK5 212-2BB00-2AA3 (NEW)
    with 12 10/100 Mbit/s RJ45 ports and two fiber-optic ports

- With electrical and optical ports for glass single mode FOC up to max. 26 km
  - **SCALANCE X204-2LD** — 6GK5 204-2BC10-2AA3
    with four 10/100 Mbit/s RJ45 ports and two long-distance fiber-optic ports
  - **SCALANCE X206-1LD**; — 6GK5 206-1BC10-2AA3
    with six 10/100 Mbit/s RJ45 ports and one long-distance fiber-optic port
  - **SCALANCE X212-2LD** — 6GK5 212-2BC00-2AA3 (NEW)
    with twelve 10/100 Mbit/s RJ45 ports and two long-distance fiber-optic ports

- With electrical ports
  - **SCALANCE X208**; — 6GK5 208-0BA10-2AA3
    with eight 10/100 Mbit/s RJ45 ports
  - **SCALANCE X208PRO** — 6GK5 208-0HA00-2AA6
    with eight 10/100 Mbit/s M12 ports, incl. eleven M12 dust protection caps, IP65 degree of protection
  - **SCALANCE X216** — 6GK5 216-0BA00-2AA3 (NEW)
    with sixteen 10/100 Mbit/s RJ45 ports
  - **SCALANCE X224** — 6GK5 224-0BA00-2AA3 (NEW)
    with twenty-four 10/100 Mbit/s RJ45 ports

Accessories

IE FC RJ45 Plug 180

RJ45 plug-in connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 180° cable outlet; for network components and CPs/ CPUs with Industrial Ethernet interface

- 1 pack = 1 unit — 6GK1 901-1BB10-2AA0
- 1 pack = 10 units — 6GK1 901-1BB10-2AB0
- 1 pack = 50 units — 6GK1 901-1BB10-2AE0

Accessories

IE M12 Plug PRO

M12 plug connector for connection of Industrial Ethernet FC installation cables; 4-pole, D-coded, metal enclosure, IP65 degree of protection, pin insert; 180° cable outlet; for network components and Industrial Ethernet stations with IP65/IP67 degree of protection

- 1 pack = 1 unit — 6GK1 901-0DB10-6AA0
- 1 pack = 8 units — 6GK1 901-0DB10-6AA8

IE Connecting Cable M12-180/M12-180

Pre-assembled IE FC TP Trailing cable GP 2 x 2 (PROFINET type C) with two 4-pole M12 plugs, 4-pole, D-coded, IP65/IP67 degree of protection; Length:

- 0.3 m — 6XV1 870-8AE30
- 0.5 m — 6XV1 870-8AE50
- 1.0 m — 6XV1 870-8AH10
- 1.5 m — 6XV1 870-8AH15
- 2.0 m — 6XV1 870-8AH20
- 3,0 m — 6XV1 870-8AH30
- 5.0 m — 6XV1 870-8AH50
- 10 m — 6XV1 870-8AN10
- 15 m — 6XV1 870-8AN15

IE M12 Panel Feedthrough

Control cabinet feedthrough for transition from 4-pole, D-coded M12 interface (IP65IP67) to RJ45 socket (IP20)

- 1 pack = 5 units — 6GK1 901-0DM20-2AA5

IE Power M12 Cable Connector PRO — 6GK1 907-0DC10-6AA3

Socket for connecting SCALANCE W-700/SCALANCE X208PRO for 24 V DC supply; 4-pole, A-coded, with installation instructions

Signaling Contact M12 Cable Connector PRO — 6GK1 908-0DC10-6AA3

Socket for connecting SCALANCE X208PRO for signaling contact; 5-pole, B-coded, with installation instructions

Power supply PS791-1PRO — 6GK5 791-1PS00-0AA6

AC/DC power supply, 10 W, IP65 (-20 to +60°C), Input: 85 V – 265 V AC, output: 24 V DC, metal housing, Scope of supply: AC power 3+PE cable connector, DC power cord M12, installation materials, manuals German/English

C-PLUG — 6GK1 900-0AB00

Swap medium for simple replacement of devices in the event of a fault; for storing configuration or engineering and application data; can be used for SIMATIC NET products with C-PLUG slot

Manual for TP and fiber-optic networks

Paper version; network architecture, components, configurations, installation guidelines

- German — 6GK1 970-1BA10-0AA0
- English — 6GK1 970-1BA10-0AA1

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SCALANCE X-300 managed plus

■ Overview

- The SCALANCE X-300 product line consists of compact Industrial Ethernet switches for establishing electrical and/or optical line, ring and star topologies at 10/100/1000 Mbit/s
- Three integral Gigabit Ethernet interfaces (10/100/1000 Mbit/s) and seven electrical Fast Ethernet interfaces (10/100 Mbit/s) for interconnecting several switches for establishing Gigabit or Fast Ethernet rings or for connecting Industrial Ethernet nodes
- High-speed media redundancy through integral redundancy manager both for Gigabit Ethernet (SCALANCE X-300, SCALANCE X-400) and Fast Ethernet (SCALANCE X-300 switches in the ring in combination with SCALANCE X-200 switches or OSM/ESM)
- Switches of the SCALANCE X-300 product line support IT standards and thus permit seamless integration of automation networks into existing corporate networks. Virtual networks (VLAN) can be set up.
- The support of standardized redundancy procedures (Rapid Spanning Tree Protocol) permits redundant integration into higher-level enterprise networks.
- By learning the multicast sources and destinations (IGMP Snooping and IGMP Querier (Internet Group Management Protocol)), SCALANCE X-300 switches can also filter multicast data traffic and thus limit the load on the network.
- Rugged metal housing in S7-300 format with facility for mounting on standard DIN rail or S7-300 rail, or for direct wall-mounting in different positions
- Compact, space-saving design for installation in control cabinet

- Rugged, industry-standard node connections with PROFINET-compliant RJ45 connectors that are latched onto the housing to provide additional strain and bending relief
- Redundant power supply for protection against power failure
- Diagnostics on the device by means of LEDs (power, link status, data traffic, fault, redundancy manager)
- Fault signaling contact, can be easily set by means of the SELECT/SET pushbutton for simple display of faults
- The devices have PROFINET diagnostics, SNMP access, integral web server, and automatic e-mail function for remote diagnostics and signaling over the network.

■ Benefits

- High availability of the network thanks to:
  - Redundant power supply
  - Redundant network structures based on fiber-optic or twisted pair cables (redundancy manager, standby function, and RSTP are integrated)
  - Easy device replacement by means of plug-in C-PLUG swap medium
- Reliable communication thanks to very fast reconfiguration of the network in the event of a fault (< 0.3 seconds)
- Simple fiber-optic connections thanks to SC sockets (Gigabit Ethernet and prepared fiber-optic cables)
- Secure data communication thanks to rugged device connection with PROFINET-compliant connectors that are latched onto the housing to provide additional strain and bending relief
- Easy network configuration without runtime calculation also for extremely large networks
- Simple and fast diagnostics by means of LED on the device, via PROFINET, integral web server, CLI, and signaling contact
- Integration into existing network management systems through standardized SNMP access
- Easy integration into process and system diagnostics with PROFINET
- Integrated configuring and diagnostics in SIMATIC STEP 7 provide significant benefits in engineering and startup and during the operating phase of the plant
- Load limiting when using multicast-based protocols (Voice over IP, Video) thanks to IGMP Snooping/Querier and additional multicast and broadcast limiting per port.
- Low-maintenance operation thanks to fanless construction
- Device replacement without the need for a programming device, using the C-PLUG swap medium for backing up the configuration data.
- Integration into enterprise security policies through support of VLAN
- Uncrossed connecting cables can be used due to integral Autocrossover function

PROFINET/Industrial Ethernet
Industrial Ethernet switches

SCALANCE X-300 managed plus

Application

SCALANCE X-300 products enable the establishment of switched networks both at the field level and at the control level where high data transfer speeds are required in addition to high network availability and extensive diagnostics facilities. The switches are designed in degree of protection IP30 for installation in control cabinets.

The main area of application is found in high-performance plant networks with connection to the enterprise network.

Product versions

SCALANCE X310

- For establishing electrical Industrial Ethernet line, star or ring topologies with seven Fast Ethernet (10/100 Mbit/s) and three Gigabit Ethernet (10/100/1000 Mbit/s) ports
- Device diagnostics by means of LEDs (power, link status, data traffic, fault, redundancy manager, standby manager)
- Remote diagnostics possible by means of signaling contact (signaling dialog box can be set on-site using pushbutton), PROFINET, SNMP and web browser
- The ten RJ45 sockets of the SCALANCE X310 are designed for use in industry with additional retaining collars for connecting the IE FC RJ45 Plug 180.
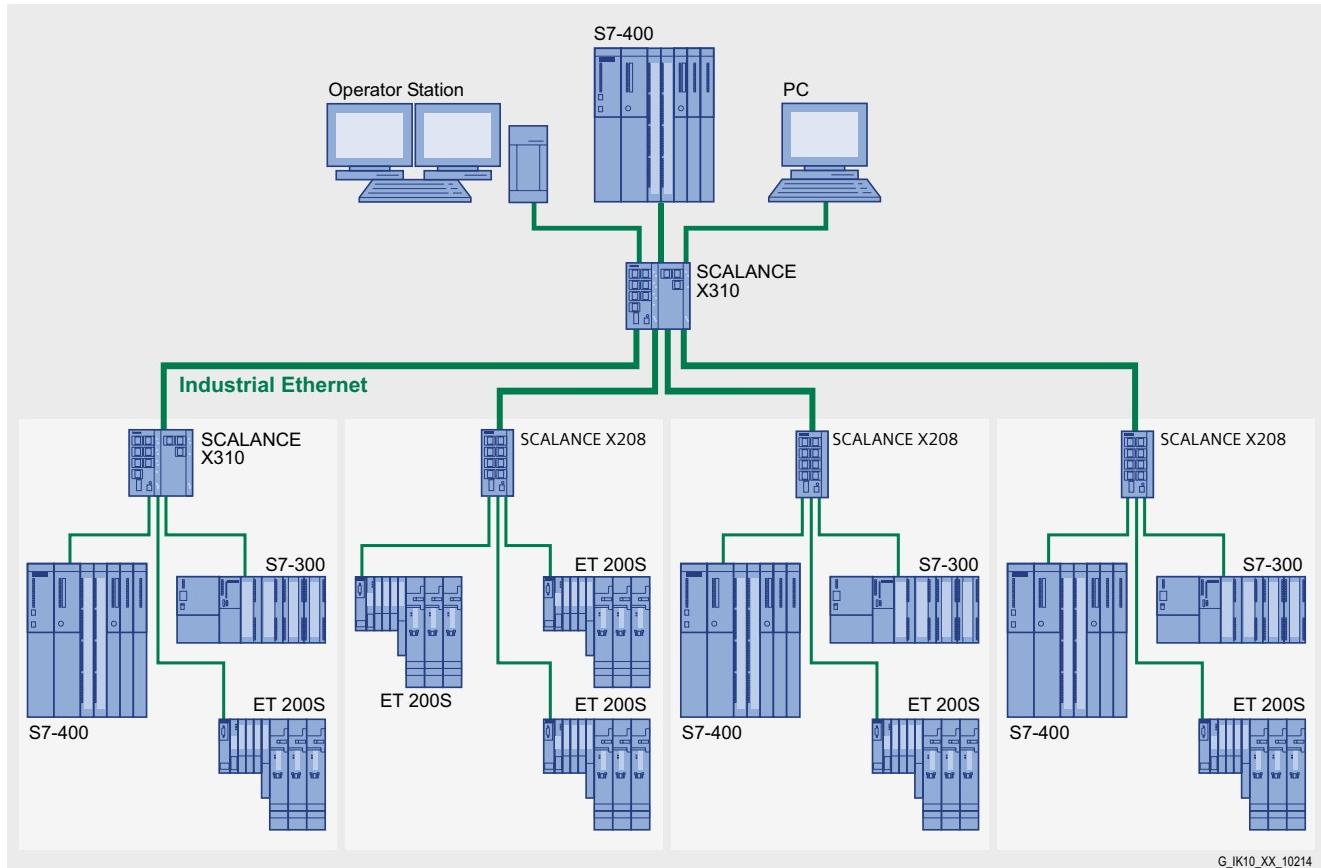
Electrical star topology with SCALANCE X310

SCALANCE X308-2, SCALANCE X308-2LD

- For establishing optical line, ring, or star topologies with seven electrical 10/100 Mbit/s ports, one electrical 10/100/1000 Mbit/s port and two optical 1000 Mbit/s ports
  - SCALANCE X308-2;
    for glass fiber-optic cable (multi-mode) up to 750 m
  - SCALANCE X308-2LD;
    for glass fiber-optic cable (single mode) up to 10 km

- Device diagnostics by means of LEDs (power, link status, data traffic, fault, redundancy manager, standby manager)
- Remote diagnostics possible by means of signaling contact (signaling dialog box can be set on-site using pushbutton), PROFINET, SNMP and web browser
- The RJ45 sockets are designed for use in industry with additional retaining collars for connecting the IE FC RJ45 Plug 180

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SCALANCE X-300 managed plus

■ **Application** (continued)
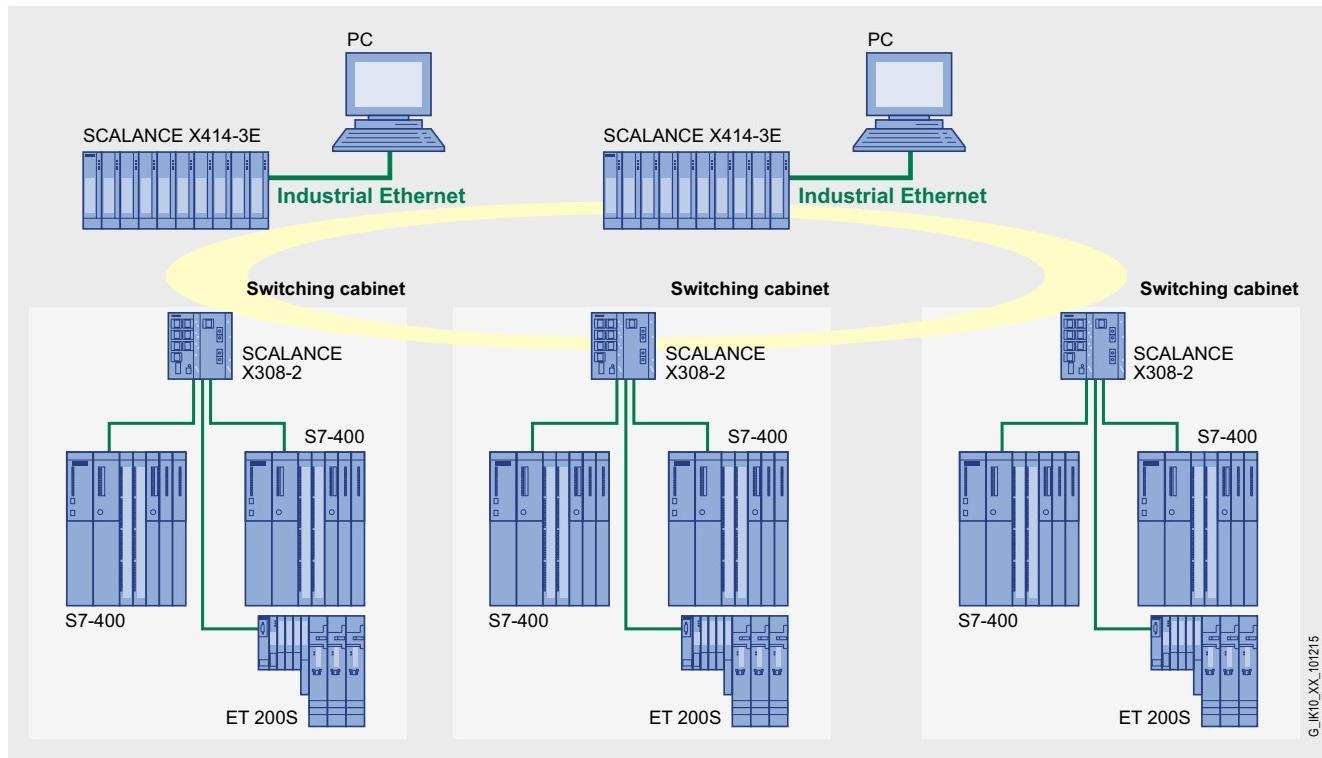
Connection of control cabinets with SCALANCE X308-2 in an optical gigabit ring

■ **Design**

The SCALANCE X-300 Industrial Ethernet switches with rugged metal housing are optimized for mounting on a standard DIN rail and the S7-300 rail. Direct wall mounting in different positions is also possible. Thanks to the S7-300 housing dimensions, the devices are suitable for integration into an automation solution with S7-300 components.

The switches have:

• a 4-pin terminal block for connecting the redundant power supply (2 x 24 V DC)

• Row of LEDs for indicating the status information (power, link status, data traffic, fault, redundancy manager, standby manager)

• A 2-pin terminal block for connecting the isolated signaling contact

• SELECT/SET key for on-site configuration of the signaling contact

• Slot for optional C-PLUG swap medium on the rear of the device for easy replacement in the event of a fault

The SCALANCE X-300 switches are available with the following port types:

• *10/100BaseTX, RJ45 connection;*
  RJ45 socket, automatic detection of the data rate (10 or 100 Mbit/s), with Autosensing and Autocrossover function for the connection of IE FC cables via IE FC RJ45 Plug 180 to 100 m.

• *10/100/1000BaseTX, RJ45 connection;*
  RJ45 socket, automatic detection of the data rate (10 or 100 or 1000 Mbit/s), with Autosensing and Autocrossover function for the connection of
  - IE FC cables 2x2 for 100 Mbit/s via IE FC RJ45 Plug 180 up to 100 m
  - IE FC cables 4x2 for 1000 Mbit/s via TP Cord and IE FC RJ45 Modular Outlet up to 100 m

• *1000BaseSX, SC connections;*
  SC sockets for direct connection to the Industrial Ethernet glass fiber-optic cable up to 750 m (multi-mode)

• *1000BaseFX, SC connections;*
  SC sockets for direct connection to the Industrial Ethernet glass fiber-optic cable up to 10 km (single mode)

■ Function

- Increase of the network performance;
  by filtering the data traffic on the basis of the Ethernet (MAC) address of the data terminals, the local data traffic remains local; only data intended for users of another subnetwork are forwarded by the switch.

- Simple network configuration and expansion;
  the switch saves the data received at the ports and forwards them independently to the destination address. Collision detection (CSMA/CD method) does not restrict the expansion of the network beyond the port.

- Limiting of error spreading to the associated subnetwork;
  the SCALANCE X-300 switches only pass on data with a valid checksum (CRC).

- Integration of existing subnetworks with 10 Mbit/s into Fast Ethernet networks with 100 Mbit/s;
  at the twisted-pair ports, the SCALANCE X-300 switch automatically recognizes the conductor pairs for transmission and reception (Autocrossover), the data transfer rate of 10 or 100 or 1000 Mbit/s, as well as full-duplex and half-duplex mode (Autonegotiation).

- High-performance connection of SCALANCE X-300 switches with 1 Gbit/s;
  SCALANCE X-300 switches have three Gigabit Ethernet ports for connecting the switches to each other or with other Gigabit-Ethernet-enabled components (e.g. SCALANCE X-400)

- High-speed redundancy (HSR) in the ring, reconfiguration time of ring max. 0.3 seconds;
  reliable communication is achieved by closing a line with SCALANCE X-300 switches to form a ring. The SCALANCE X-300 switch has an integral redundancy manager (RM) which monitors the function of the network continuously. It recognizes the failure of a transmission link in the ring or of a SCALANCE X-300 switch and activates the standby link within no more than 0.3 seconds. Rings consisting of SCALANCE X-300 and X-400 switches can be operated at 1000 Mbit/s. In rings with SCALANCE X-200 or OSM/ESM it is possible to integrate SCALANCE X-300 switches at 100 Mbit/s.

- High-speed standby redundancy;
  several network segments such as rings can be connected together redundantly with SCALANCE X-300 over the integrated standby function. Two X-300 switches are configured in a ring as a master and slave over two links to the other ring. The redundant connection can be made at 1000 Mbit/s.

- Redundant interfacing to company networks;
  SCALANCE X-300 switches support the standardized redundancy procedures Spanning Tree Protocol (STP) and Rapid Spanning Tree Protocol (RSTP). This enables a subnetwork to be connected redundantly to a higher level corporate network with reduced requirements for the reconfiguration time (in the order of seconds).

- Support of virtual networks (VLAN);
  for structuring Industrial Ethernet networks with a fast growing number of users, a physically existing network can be divided into several virtual networks.

- Load limiting when multicast protocols (e.g. video transmission) are used;
  through learning the multicast sources and targets (IGMP Snooping, IGMP Querier), SCALANCE X-300 switches can also filter multicast data traffic and therefore limit the load in the network.

- Time synchronization;
  diagnostic messages (log table entries, e-mails) are time-stamped. The local time is standardized throughout the network by means of synchronization with a SICLOCK or SNTP time transmitter, thereby simplifying the assignment of diagnostic messages to several devices.

- Fast replacement of devices in event of failure, by means of the C-PLUG switching medium

Network topology and network configuration

The SCALANCE X-300 Industrial Ethernet switches with degree of protection IP30 are typically accommodated in a control cabinet along with the nodes to be connected. The can be mixed electrically and optically in star, line and ring topologies.

The following network structures and combinations of structures can be implemented:

- Fast Ethernet and Gigabit Ethernet rings with fast media redundancy;
  to protect against failure of a transmission link or a switch, as many as 50 SCALANCE X-200, X-300 or X-400 switches cascaded in line can be connected into a ring with a total length of up to 150 km with multi-mode or 1300 km with single mode. On the failure of a transmission link or a SCALANCE X switch in the ring, the transmission path is reconfigured within 0.3 seconds.

- Several rings can be redundantly linked through the standby function

- In addition, SCALANCE X-300 supports redundant connection of the ring structure to the corporate network with a rapid spanning tree.

- Star topology with SCALANCE X-300 switches:
  The SCALANCE X-300 switch represents a neutral point that can connect up to ten nodes or subnets with each other electrically or optically.

When configuring the network, it is necessary to observe the following boundary conditions:

- Maximum line length between two modules for multi-mode fiber-optic conductors:
  - 750 m at 1 Gbit/s

- Maximum line length between two modules for single-mode fiber-optic conductors:
  - 10 km at 1 Gbit/s

- Maximum cable length of the TP cable between two SCALANCE X switches:
  - Max. 100 m with IE FC cable 2x2 and IE FC RJ45 Plug 180
  - Max. 90 m at 1 Gbit/s with IE FC Standard Cable 4x2, IE FC RJ45 Modular Outlet and patch cable (10 m)
  - max. 10 m using patches with TP cord

PROFINET/Industrial Ethernet
Industrial Ethernet switches

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SCALANCE X-300 managed plus

■ **Function** (continued)

Commissioning and diagnosis

Setting options on the device itself:

- Redundancy manager RM;
  to establish a ring, a SCALANCE X-300 is switched to RM mode. The Gigabit ports (electrical or optical) are preferably used as ring ports.

- Signal mask;
  the signal mask is set to the current status of the SCALANCE X-300 (setpoint) by pushbutton operation. The signal mask defines which ports and which power supplies are to be monitored. The signal contact only reports an error when a monitored port or a monitored feeder fails (deviation of setpoint/ actual status).

- IP address;
  the IP address is assigned via DHCP (Dynamic Host Configuration Protocol). If there is no corresponding server in the network, the IP address can be assigned using an enclosed software tool.

Diagnostic options on site:

- The following status information is displayed by LEDs on site:
  - Port status
  - Port mode (10/100/1000 Mbit/s, full/half-duplex)
  - Status of the two power supplies
  - Signal contact status
  - Signal mask (setpoint status)
  - RM mode
  - Standby mode

- The status of the signal contact is routed externally by means of floating relay contacts. This enables, for example, the module to be monitored via an input module from a controller.

- Monitoring via the Industrial Ethernet network;
  the following possibilities are available:
  - Remote via standard browser (Web-based management):
    Selection of SCALANCE X-300 switches via the network from a PC with browser
  - Remote via SNMP V1, V2c, V3:
    Secure integration of SCALANCE X-300 switches via the network into a network management station
  - Remote via PROFINET IO diagnostics:
    PROFINET IO diagnostics alarms from X-300 switches can be displayed using the relevant SIMATIC engineering tools or they can also be processed in the PLC. The engineering outlay is drastically reduced for the PLC and HMI through complete integration into the SIMATIC SFM system error signaling concept.

Network management

The network management provides the following functions:

- Password-protected dial-up for "Administrator" (read and write authorization) and "User" (read only)

- Read-out of version and status information

- Setting the signal and standby mask and address information

- Fixed parameterization of the ports (data rates, half/full duplex)

- Setting parameters of the VLANs and multicast services

- Parameterization of the standby connections for a redundant ring link

- Setting of Rapid Spanning Tree parameters

- Parameterization of the web management services

- Security
  - Ports can be connected or disconnected

- Parameterization of user administration of SNMP V1, V2c, V3

- Output of statistics information

- Diagnosis of data traffic by means of a parameterizable mirror port with a standard commercial network analyzer

- Loading of new firmware or the configuration data via the network by a TFTP server

- Saving the configuration data or log table via the network on a TFTP server

If faults occur in the network, the SCALANCE X-300 switch can send error messages (traps) to a network management system or also e-mails to a predefined network administrator.

The **remote monitoring (RMON)** offers the following functions: The SCALANCE X-300 switch can collect statistics information according to the RMON groups 1 through 4. These include, for example, fault statistics that are kept for each port. This information can be read out through web-based management in the statistics sub-area.

PROFINET/Industrial Ethernet
Industrial Ethernet switches

SCALANCE X-300 managed plus

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◼ Technical specifications

Type	SCALANCE X310	SCALANCE X308-2	SCALANCE X308-2LD
Transfer rate	10/100/1000 Mbit/s	10/100/1000 Mbit/s	10/100/1000 Mbit/s
Interfaces			
• Communication connection, electrical	• 3 x RJ45 (10/100/1000 Mbit/s; TP) • 7 x RJ45 (10/100 Mbit/s; TP)	• 1 x RJ45 (10/100/1000 Mbit/s; TP) • 7 x RJ45 (10/100 Mbit/s; TP)	• 1 x RJ45 (10/100/1000 Mbit/s; TP) • 7 x RJ45 (10/100 Mbit/s; TP)
• Communication connection, optical	–	2 x glass fiber-optic cable (multi-mode) with SC socket (1000 Mbit/s)	2 x glass fiber-optic cable (single mode) with SC socket (1000 Mbit/s)
• Connection for power supply	1 x 4-pin terminal block	1 x 4-pin terminal block	1 x 4-pin terminal block
• Connection for signaling contact	1 x 2-pin terminal block	1 x 2-pin terminal block	1 x 2-pin terminal block
• Slot for swap medium	C-PLUG	C-PLUG	C-PLUG
Supply voltage	2 x 24 V DC (18 V to 32 V)	2 x 24 V DC (18 V to 32 V)	2 x 24 V DC (18 V to 32 V)
Current consumption, max.	400 mA	400 mA	400 mA
Power loss at 24 V DC	9.6 W	9.6 W	9.6 W
Network extension parameter / TP cable length at 100 Mbit/s			
• 0 - 100 m	IE FC Standard Cable GP with IE FC RJ45 Plug IE FC Outlet RJ 45 with IE FC Standard Cable GP (0 - 90 m) + 10 m TP cord	IE FC Standard Cable GP with IE FC RJ45 Plug IE FC Outlet RJ 45 with IE FC Standard Cable GP (0 - 90 m) + 10 m TP cord	IE FC Standard Cable GP with IE FC RJ45 Plug IE FC Outlet RJ 45 with IE FC Standard Cable GP (0 - 90 m) + 10 m TP cord
• 0 - 85 m	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Marine/Trailing/Flexible Cable (0 - 75 m) + 10 m TP Cord	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Marine/Trailing/Flexible Cable (0 - 75 m) + 10 m TP Cord	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE FC Marine/Trailing/Flexible Cable (0 - 75 m) + 10 m TP Cord
• 0 - 55 m	IE TP Torsion Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE TP Torsion Cable (0-45 m) + 10 m TP Cord	IE TP Torsion Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE TP Torsion Cable (0-45 m) + 10 m TP Cord	IE TP Torsion Cable with IE FC RJ45 Plug IE FC Outlet RJ45 with IE TP Torsion Cable (0-45 m) + 10 m TP Cord
• 0 - 750 m	–	Cable length multi-mode fiber-optic cable at 1000 Mbit/s; glass fiber-optic cable 50/125 µm; $\leq$ 2.7 dB/km at 850 nm; $\geq$ 600 MHz x km	–
• 0 - 10,000 m	–	–	Cable length single-mode fiber-optic cable at 1000 Mbit/s; 10/125 µm or 9/125 µm; $\leq$ 0.5 dB/km at 1300 nm
Permissible ambient conditions			
• Operating temperature	0 °C to +60 °C	0 °C to +60 °C	0 °C to +60 °C
• Transport/storage temperature	-40 °C to +80 °C	-40 °C to +80°C	-40 °C to +80 °C
• Relative humidity in operation	< 95%, non-condensing	< 95%, non-condensing	< 95%, non-condensing
Design			
• Dimensions (W x H x D) in mm	120 x 125 x 124	120 x 125 x 124	120 x 125 x 124
• Weight	1400 g	1400 g	1400 g
• Mounting	DIN rail, S7-300 rail, wall mounting	DIN rail, S7-300 rail, wall mounting	DIN rail, S7-300 rail, wall mounting
Degree of protection	IP30	IP30	IP30
Approvals			
• Radio interference level	EN 61000-6-4 Class A	EN 61000-6-4 Class A	EN 61000-6-4 Class A
• Noise immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
• CuL listing	UL 60950-1, CSA C22.2 No. 60950-1; UL 508, CSA C22.2 No. 14-M91; UL 1604 and 2279 (Hazardous Location)	UL 60950-1, CSA C22.2 No. 60950-1; UL 508, CSA C22.2 No. 14-M91; UL 1604 and 2279 (Hazardous Location)	UL 60950-1, CSA C22.2 No. 60950-1; UL 508, CSA C22.2 No. 14-M91; UL 1604 and 2279 (Hazardous Location)
• FM	FM 3611	FM 3611	FM 3611
• ATEX Zone 2	EN 50021	EN 50021	EN 50021
• C-Tick	AS/NZS 2064 (ClassA)	AS/NZS 2064 (Class A)	AS/NZS 2064 (ClassA)
• CE	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4

PROFINET/Industrial Ethernet
Industrial Ethernet switches

SCALANCE X-300 managed plus

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■ Ordering data	Order No.		Order No.
SCALANCE X-300 Industrial Ethernet switches		*Accessories*	
Managed plus Industrial Ethernet switches; RJ45 ports for establishing electrical and/or optical Industrial Ethernet networks; integral Redundancy Manager, IT functions (RSTP, VLAN, etc.), network management via SNMP and web server; C-PLUG included in the scope of supply		**IE FC RJ45 Modular Outlet** FastConnect RJ45 outlet for Industrial Ethernet with interface for replaceable insert;	
		• **With insert 2FE**; replaceable insert for 2 x 100 Mbit/s interfaces	6GK1 901-1BE00-0AA1
		• **With insert 1GE**; replaceable insert for 1 x 1000 Mbit/s interface	6GK1 901-1BE00-0AA2
• **SCALANCE X310**; with three 10/100/1000 Mbit/s RJ45 ports and seven 10/100 Mbit/s RJ45 ports	6GK5 310-0FA00-2AA3	**IE FC TP Standard Cable GP 4 x 2**	6XV1 870-2E
• **SCALANCE X308-2**; with two 1000 Mbit/s multi-mode fiber-optic ports (SC sockets), one 10/100/1000 Mbit/s RJ45 port and seven 10/100 Mbit/s RJ45 ports	6GK5 308-2FL00-2AA3	8-core, shielded TP installation cable for connection to IE FC RJ45 Modular Outlet for universal applications; with UL approval; sold by the meter; max. quantity 1000 m, minimum order 20 m	
• **SCALANCE X308-2LD**; with two 1000 Mbit/s single-mode fiber-optic ports (SC sockets), one 10/100/1000 Mbit/s RJ45 port and seven 10/100 Mbit/s RJ45 ports	6GK5 308-2FM00-2AA3	**IE FC RJ45 Plug 180** RJ45 connector for Industrial Ethernet with rugged metal housing and integral insulation displacement contacts for connecting the Industrial Ethernet FC installation cables; with 180° cable outlet; for network components and CPs/CPUs with Industrial Ethernet interface	
		• 1 pack = 1 unit	6GK1 901-1BB10-2AA0
		• 1 pack = 10 units	6GK1 901-1BB10-2AB0
		• 1 pack = 50 units	6GK1 901-1BB10-2AE0
		C-PLUG Swap medium for simple replacement of devices in the event of a fault; for accommodating configuration data and application data, suitable for use in SIMATIC NET products with C-PLUG slot	6GK1 900-0AB00
		Manual for TP and fiber-optic networks Paper version; network architecture, components, configurations, installation guidelines	
		• German	6GK1 970-1BA10-0AA0
		• English	6GK1 970-1BA10-0AA1

SCALANCE X-400 modular

◼ Overview

- The SCALANCE X-400 product range comprises modular Industrial Ethernet switches expandable by various media modules and partially by extenders.
  It supports 10/100/1000-Mbit technology for various transmission media (twisted pair, fiber optic) and increased port requirements. The main applications are high-performance plant networks (control level). Thanks to its partly modular design, the X-400 product line is also designed for future requirements and can be adapted to the relevant task.

- The SCALANCE X-400 Industrial Ethernet switches have two to four integral Gigabit Ethernet twisted pair interfaces (10/100/1000 Mbit/s) for connecting a number of switches to one another. Nodes are connected via the Fast Ethernet twisted pair ports (10/100 Mbit/s) integrated in the basic device.

- In the case of SCALANCE X414-3E, another eight stations can be connected via extender modules on the basic device. The following extender modules are available:
  - Extenders with eight Fast Ethernet twisted-pair ports
  - Extenders with four media module slots for up to eight Fast Ethernet fiber optic ports

- The integrated redundancy manager facilitates high-speed media redundancy even for large networks, both for Gigabit Ethernet (SCALANCE X-400 switches in the ring) and for Fast Ethernet (SCALANCE X-400 switches in the ring in combination with SCALANCE X-200 switches or OSM/ESM).

- For the construction of optical Gigabit Ethernet rings, the integrated Gigabit Ethernet ports can be converted to fiber optic via a 2-port Gigabit Ethernet media module (MM). Module variants for multi-mode (up to 750 m FOC) and single-mode (up to 10 km) are available.

- By means of pluggable 2-port Fast Ethernet media modules for multi-mode or alternatively single-mode fiber-optic cable, SCALANCE X-400 switches can also be integrated into 100-Mbit/s rings, e.g. with SCALANCE X204-2 or OSM. It is then possible to also provide an optical link to remote stations.

- Remote diagnostics is possible by means of PROFINET diagnostics, web browser or SNMP.

- Switches of the SCALANCE X-400 product line support IT standards and thus permit seamless integration of automation networks into existing corporate networks. Virtual networks (VLAN) can be set up.

- The support of standardized redundancy procedures (Rapid Spanning Tree Protocol) permits the redundant integration into higher level enterprise networks.

- Through learning the Multicast sources and targets (IGMP (**I**nternet **G**roup **M**anagement **P**rotocol snooping), SCALANCE X-400 switches can also filter Multicast data traffic and therefore limit the load in the network.

- With SCALANCE X414-3E, Layer 3 routing 🆕 permits communication between different IP subnets
  - Static routing
  - Dynamic routing OSPF (**O**pen **S**hortest **P**ath **F**irst) and RIPv1/2 (**R**outing **I**nformation **P**rotocol)
  - Redundant routing VRRP (**V**irtual **R**outer **R**edundancy **P**rotocol)

◼ Benefits

- Flexible configuration of electrical or optical Industrial Ethernet networks; the network topology, type and number of ports can be adapted easily to the structure of the plant.

- High availability of the network thanks to:
  - Redundant power supply
  - Redundant network structures based on fiber-optic or twisted pair cables (redundancy manager, standby function, RSTP and VRRP are integrated)
  - Replacement and extension of media and expansion modules during operation
  - Easy device replacement by means of plug-in C-PLUG swap medium

- Reliable communication thanks to very fast reconfiguration of the network in the event of a fault (< 0.3 seconds)

- Simple fiber optic connection technology by means of SC sockets (Gigabit Ethernet), BFOC sockets (Fast Ethernet) and prefabricated fiber optic cables

- Twisted pair ports readily accessible from the front, 10/100 Mbit/s;
  ports with sleeve for rugged, industry-compatible station connection for direct connections up to 100 m in conjunction with the PROFINET-compatible IE FC RJ45 Plug 180 or IE FC RJ45 Plug 145 connector

- Easy network configuration without runtime calculation also for extremely large networks

- Simple monitoring and diagnosis by means of signaling contact, digital inputs, SNMP and e-mail; PROFINET IO diagnostics

- Reduced engineering expenditure for PLC/HMI due to integration into the SIMATIC system fault message concept SFM

- Thanks to the integrated Layer 3 function (IP routing) – static, dynamic and redundant – of SCALANCE X414-3E, networks can be divided into different subnets

- Investment protection for existing networks due to
  - Effortless connection of existing 10 Mbit/s data terminals or network segments to Fast Ethernet networks with 100 Mbit/s
  - Increase in performance through load decoupling and data transfer rates of 100 Mbit/s and 1000 Mbit/s
  - Easy integration into existing network management infrastructures by means of SNMP

- Support of VLAN permits integration into Enterprise Security Policies

- Limiting of load on application of Multicast-based protocols (e.g. video transmission) through IGMP (**I**nternet **G**roup **M**anagement **P**rotocol) snooping or GMRP (**G**ARP **M**ulticast **R**egistration **P**rotocol)

- Protection of network against overload by setting of port thresholds

- Operating temperature range from 0 °C to +60 °C

- Low-maintenance operation thanks to fanless construction

PROFINET/Industrial Ethernet
Industrial Ethernet switches

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SCALANCE X-400 modular

■ Application

SCALANCE X-400 products permit the configuration of switched networks at the control level, which not only demands high availability of the network and extensive diagnostic options, but also a high number of ports, high transfer rate and the support of fiber optic and twisted-pair transmission media. SCALANCE X-400 products are designed with IP20 degree of protection for installation in control cabinets.

SCALANCE X408-2 🔵

- Control stations with a low concentration of devices
- Star hub in plant bus for applications with low concentration of devices
- High-speed backbone including high-speed redundancy for process control systems
- In the high-speed backbone for coupling Gigabit network topologies

SCALANCE X414-3E

- Control stations with a high concentration of devices
- Star hub in plant bus for applications with high concentration of devices
- High-speed backbone including high-speed redundancy for process control systems
- SCALANCE X414-3E with Layer 3 functionality for IP routing (static, dynamic, redundant)

■ Design

SCALANCE X408-2 🔵/SCALANCE X414-3

Communication connections:

- Integral Gigabit Ethernet twisted pair ports (10/100/1000 Mbit/s, RJ45 sockets) for connecting SCALANCE X-400 switches together:
  - *SCALANCE X408-2:*
    4 Gigabit Ethernet twisted pair ports
  - *SCALANCE X414-3E:*
    2 Gigabit Ethernet twisted pair ports
- Integral Fast Ethernet twisted pair ports (10/100 Mbit/s, RJ45 sockets with securing collar) for node connection
  - *SCALANCE X408-2:*
    4 Fast Ethernet twisted pair ports
  - *SCALANCE X414-3E:*
    12 Fast Ethernet twisted pair ports
- The Gigabit Ethernet ports can be converted to fiber-optic connections with optical Gigabit Ethernet media modules

Only for *SCALANCE X408-2*:

- Two universal slots either for optical Fast Ethernet or Gigabit Ethernet media modules with two ports

Only for *SCALANCE X414-3E*:

- Two slots for optical Fast Ethernet media modules with two ports
- One extender interface for expansion by 8 Fast Ethernet ports (twisted pair or fiber optic, depending on extender version). In this way, a maximum configuration of two Gigabit Ethernet Ports (electrical or optical) and up to 24 Fast Ethernet Ports (of which between 4 and 12 can be optical) is possible. The installation width including extender is max. 19".

Interfaces

- Console port (serial interface) for on-site parameterization/diagnostics, for firmware update;
- Slot for C-PLUG swap medium for easy device replacement (included in scope of supply)
- Redundant 24 V DC supply; two feeds are available for protection against voltage failure
- One floating message output for simple display of faults

Only for *SCALANCE X414-3E*:

- Additional out-band Ethernet port for on-site parameterization/diagnostics, for firmware update
- Eight floating inputs for recording digital status information such as signal contacts of PROFIBUS OLM or door contacts and forwarding via SCALANCE X-400 diagnostic paths (LED indicator, log table, trap or Email)

Extensive operating mode and status information is displayed via LEDs and selection pushbuttons.

SCALANCE X-400 media modules (MM)

SCALANCE X-400 switches can be equipped with fiber-optic cables using media modules. Media modules are available for both multi-mode and single-mode optical fibers. They can be added or replaced during network operation. The SCALANCE X414-3E basic unit supports two optical Gigabit Ethernet ports and up to four additional optical Fast Ethernet ports.

SCALANCE X408-2 supports either up to four optical Gigabit Ethernet ports or up two four optical Fast Ethernet ports

The following media modules are available:

- MM491-2;
  2 fiber optic ports (BFOC sockets) 100 Mbit/s for distances up to 3 km with multi-mode fiber-optic conductors
- MM491-2LD;
  2 fiber optic ports (BFOC sockets) 100 Mbit/s for distances up to 26 km with single-mode fiber-optic conductors
- MM492-2;
  2 fiber optic ports (SC sockets) 1 Gbit/s for distances up to 750 m with multi-mode fiber-optic conductors (when using SIMATIC NET FO Cable 50/125 µm)
- MM492-2LD;
  2 fiber optic ports (SC sockets) 1 Gbit/s for distances up to 10 km with single-mode fiber-optic conductors

Plug-in media modules for Gigabit Ethernet convert the two Gigabit Ethernet twisted pair-ports included in the switch to optical mode. The Gigabit ports can then be used as either twisted-pair or fiber-optic ports. In the case of the SCALANCE X414-3E basic device, optical media modules for Fast Ethernet each generate two additional ports per slot.

■ **Design** (continued)

SCALANCE X-400 extender module (EM),
only for SCALANCE X414-3E

An optional extender module with up to 8 further Fast Ethernet ports can be mounted next to the expansion interface of the SCALANCE X414-3E.

Versions:

- EM495-8;
  with 8 twisted pair ports (RJ45 sockets with sleeves) 10/100 Mbit/s;
  this enables the 12 onboard Fast Ethernet twisted pair ports of the SCALANCE X414-3E to be expanded to a total of 20 ports.

- EM496-4;
  with a further four media module slots for Fast Ethernet media modules for up to 8 optical Fast Ethernet ports

The structure of the SCALANCE X-400 product line offers the following advantages:

- Simple user connection via twisted pair
- Gigabit Ethernet transfer rate between SCALANCE X-400 switches
- Fiber optic connection via fiber-optic media modules
- Reduced costs for spare parts inventories;
  Electrical and optical variants are covered by a basic unit and fiber-optic media modules
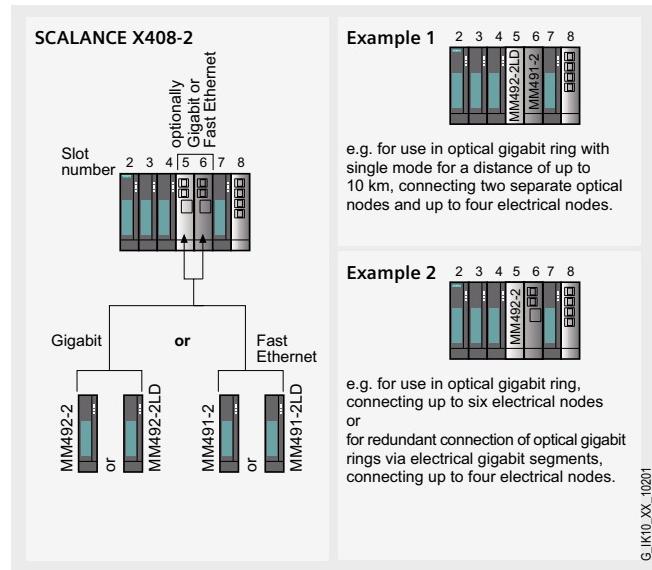
Possible applications of the media modules with SCALANCE X408-2
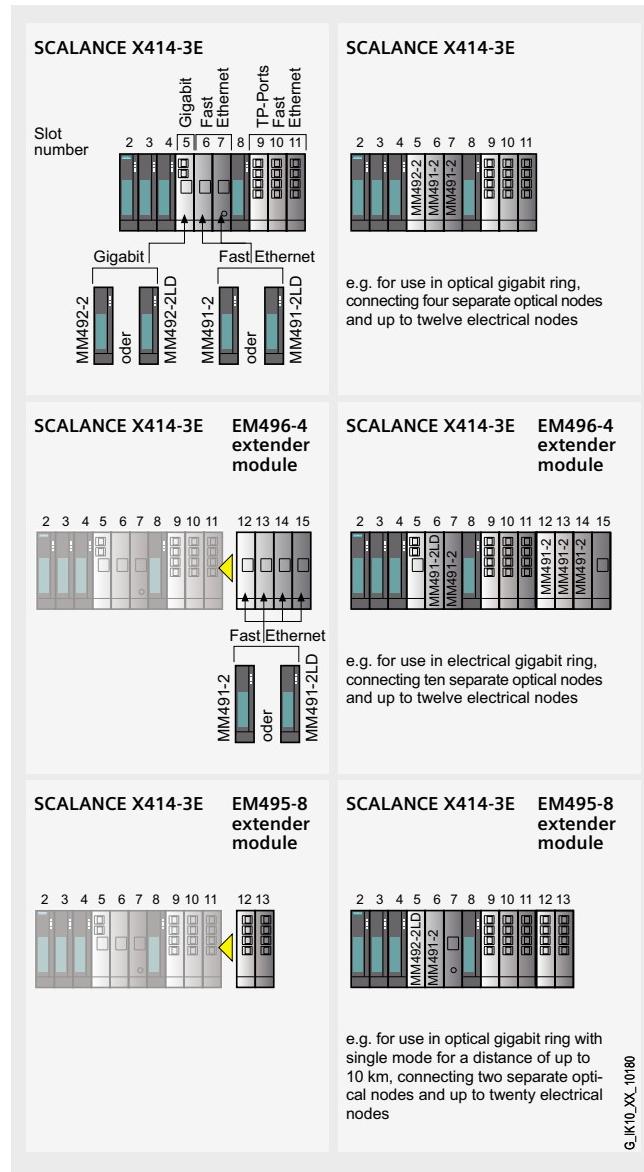
Possible applications of the media and extender modules with SCALANCE X 414-3

PROFINET/Industrial Ethernet
Industrial Ethernet switches

2

SCALANCE X-400 modular

■ **Function**

- Increasing the network performance;
  by filtering the data traffic on the basis of the Ethernet (MAC) address of the data terminals, the local data traffic remains local; only data intended for users of another subnetwork are forwarded by the switch.

- Simple network configuration and expansion;
  the switch saves the data received at the ports and forwards them independently to the destination address. Collision detection (CSMA/CD method) does not restrict the expansion of the network beyond the port.

- Limiting of error spreading to the associated subnetwork;
  the SCALANCE X-400 switches only pass on data with a valid checksum (CRC).

- Integration of existing subnetworks with 10 Mbit/s into Fast Ethernet networks with 100 Mbit/s;
  at the twisted-pair ports, the SCALANCE X-400 switch automatically recognizes the conductor pairs for transmission and reception (Autocrossover), the data transfer rate of 10 or 100 Mbit/s, as well as full-duplex and half-duplex operation (Autonegotiation).

- High-performance connection of SCALANCE X-400 switches with 1 Gbit/s;
  SCALANCE X-400 switches have two (X414-3E) or four (X408-2) Gigabit Ethernet ports for connecting the switches to each other.

- High-speed redundancy (HSR) in the ring, reconfiguration time of ring max. 0.3 seconds;
  reliable communication is achieved by closing an optical line with SCALANCE X-400 switches to form a ring.
  The SCALANCE X-400 switch has an integral redundancy manager (RM) which monitors the function of the network continuously. It recognizes the failure of a transmission link in the ring or of a SCALANCE X-400 switch and activates the standby link within no more than 0.3 seconds. Rings consisting of SCALANCE X-400 switches can be operated at 1000 Mbit/s. In rings with SCALANCE X-200 or OSM/ESM it is possible to integrate SCALANCE X-400 switches at 100 Mbit/s.

- High-speed standby redundancy;
  several network segments such as rings can be connected together redundantly with SCALANCE X-400 over the integrated standby function. Two X-400 switches are configured in a ring as a master and slave over two links to the other ring. In the case of SCALANCE X408-2, a high-performance redundant coupling with 1000 Mbit/s is possible.

- Redundant interfacing to company networks;
  SCALANCE X-400 switches support the standardized redundancy procedures Spanning Tree Protocol (STP) and Rapid Spanning Tree Protocol (RSTP). This enables a subnetwork to be connected redundantly to a higher level corporate network with reduced requirements for the reconfiguration time (in the order of seconds).

- Support of virtual networks (VLAN);
  for structuring Industrial Ethernet networks with a fast growing number of users, a physically existing network can be divided into several virtual networks.

- Integrated Layer 3 function (IP routing);
  only SCALANCE X414-3E
  Different IP subnetworks can be interconnected, e.g. automation network with office network, enabling structuring of the networks

- Load limiting with use of Multicast protocols (e.g. video transmission);
  through learning the Multicast sources and targets (IGMP snooping), SCALANCE X-400 switches can also filter Multicast data traffic and therefore limit the load in the network.

- Time synchronization;
  diagnostics messages (log table entries, e-mails) are time-stamped. The local time is standardized throughout the network by means of synchronization with a SICLOCK or SNTP time transmitter, thereby simplifying the assignment of diagnostic messages to several devices.

- Fast replacement of devices in event of failure, by means of the C-PLUG switching medium

■ **Function** (continued)
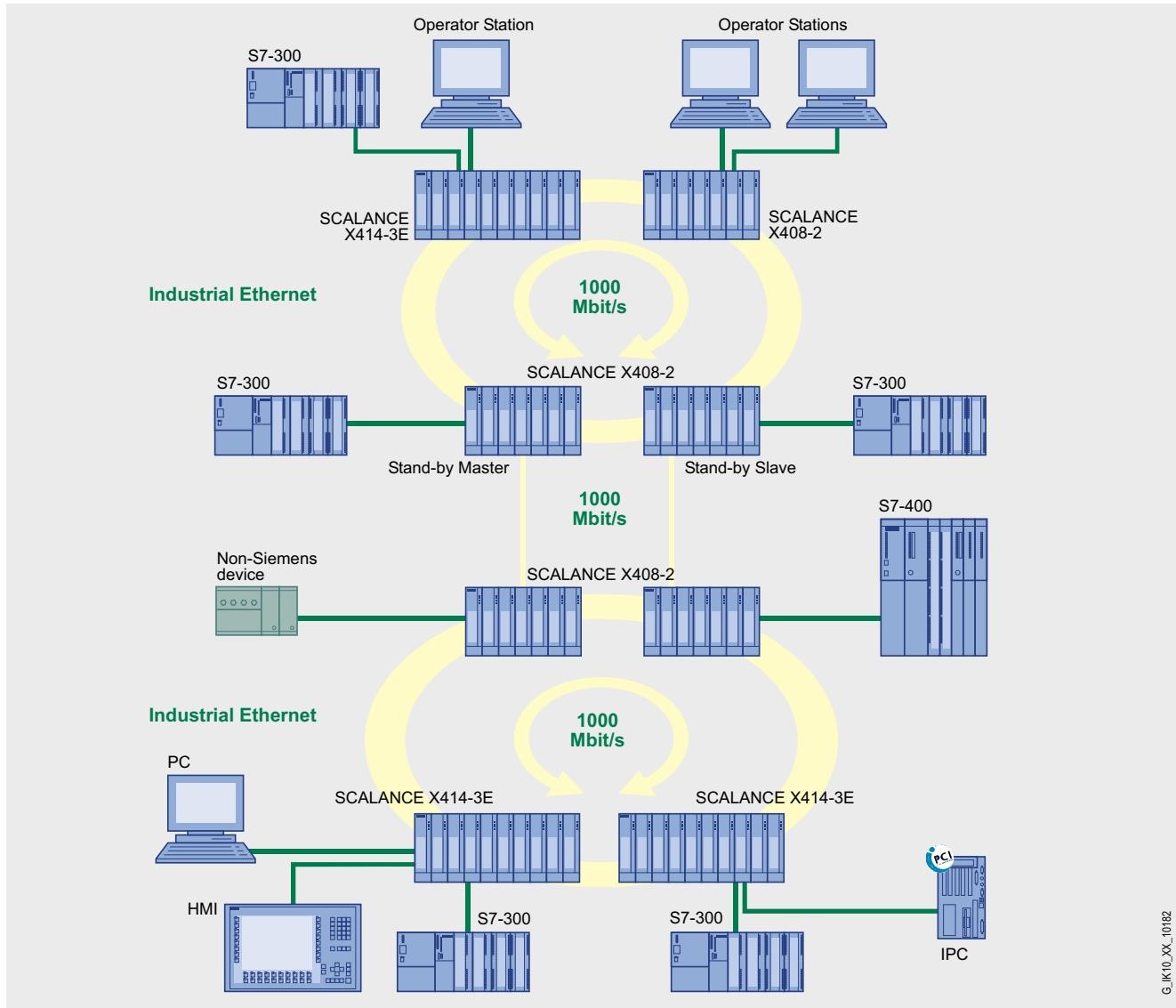
Optical redundant connection of two optical Gigabit subnets with SCALANCE X-400 on Layer 2 and Layer 3

2

SCALANCE X-400 modular

■ **Function** (continued)
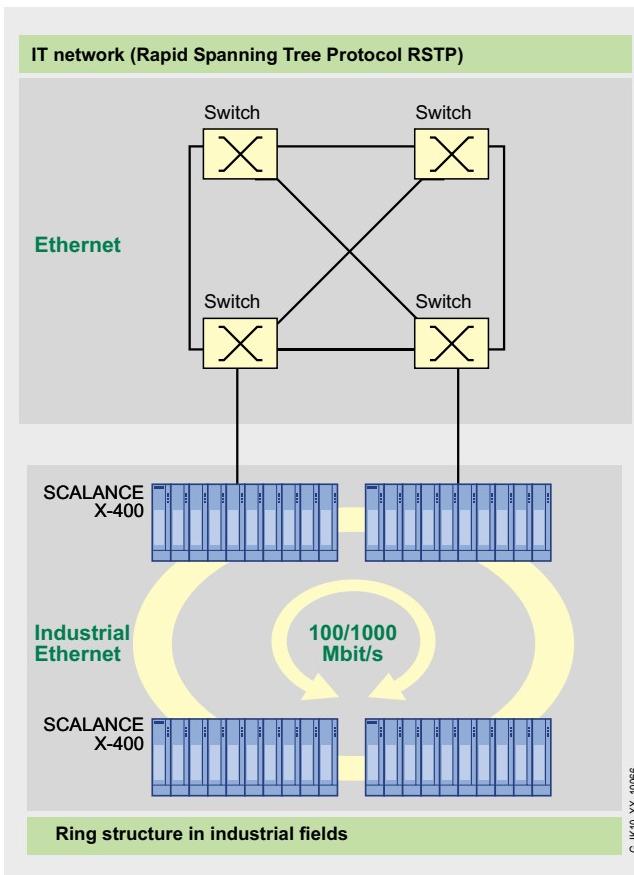
Redundant coupling with an Office network and industrial network on Layer 2 and Layer 3

Network topology and network configuration

The network topology can easily be adapted to the structure of the plant with SCALANCE X-400 Industrial Ethernet switches. The following network structures and combinations of structures can be implemented:

- Fast Ethernet and Gigabit rings with fast media redundancy; to protect against failure of a transmission link or a switch, as many as 50 SCALANCE X-400 switches cascaded in line can be connected into a ring with a total length of up to 150 km with multi-mode or 1300 km with single-mode. On the failure of a transmission link or a SCALANCE X-400 switch in the ring, the transmission path is reconfigured within 0.3 seconds.
- Several rings can be redundantly linked through the standby function
- In addition, SCALANCE X-400 supports redundant connection of the ring structure to the corporate network with a rapid spanning tree.
- Star topology with SCALANCE X-400 switches: The SCALANCE X-414-3E switch represents a star point which can interconnect as many as 26 nodes or subnetworks electrically or optically; SCALANCE X408-2 can connect up to 8 nodes or subnetworks

When configuring the network, it is necessary to observe the following boundary conditions:

- Maximum line length between two modules for multi-mode fiber-optic conductors:
  - 3000 m at 100 Mbit/s
  - 750 m at 1 Gbit/s
- Maximum line length between two modules for single-mode fiber-optic conductors:
  - 26 km at 100 Mbit/s
  - 10 km at 1 Gbit/s
- Maximum length of installation cable:
  - 100 m at 100 Mbit/s with IE FC TP Cable 2 x 2
  - Max. 90 m at 1 Gbit/s with IE FC TP Cable 4 x 2, IE FC RJ45 Modular Outlet and patch cable (10 m)

Commissioning and diagnosis

Adjustment options on the device itself:

- Redundancy manager RM; to establish a ring, a SCALANCE X-400 is switched to RM mode. The Gigabit ports (electrical or – with media module – optical) are preferably used as ring ports. When using in optical rings with 100 Mbit/s, the ring ports can be configured on one media module or on two media modules.
- Signal mask; the signal mask is set to the current status of the SCALANCE X-400 (setpoint) by pushbutton operation. The signal mask defines which ports and which power supplies are to be monitored. The signal contact only reports an error when a monitored port or a monitored feeder fails (deviation of setpoint/actual status).

Diagnostic options on site:

- The following status information is displayed by LEDs on site:
  - Port status
  - Port mode (10/100/1000 Mbit/s, full/half-duplex)
  - Status of the two voltage feeders
  - Signal contact status
  - Signal mask (setpoint status)
  - RM mode
  - Standby mode
- The status of the signal contact is routed externally by means of floating relay contacts. This enables, for example, the module to be monitored via an input module from a controller.
- A PC or a programming device can be directly connected via a serial interface or, with the X414-3E, also via an Ethernet interface (out-band port). Operation is carried out using commands (Command Line Interface (CLI)).
- Monitoring via the Industrial Ethernet network; the following possibilities are available:
  - Remote via standard browser (Web-based management): Selection of SCALANCE X-400 switches via the network from a PC with browser
  - Remote via SNMP V1, V2c, V3: Secure integration of SCALANCE X-400 switches via the network into a network management station
  - Remote via PROFINET IO diagnostics
  - Standard diagnostic alarms can be configured in an easy, familiar manner in STEP 7 and processed in SIMATIC. The engineering outlay is drastically reduced for the PLC and HMI through complete integration in the SIMATIC system error message concept SFM.

■ **Function** (continued)

Network management

The network management provides the following functions:

- Password-protected dial-up for "Administrator" (read and write authorization) and "User" (read only)
- Read-out of version and status information
- Setting the signal and standby mask and address information
- Fixed parameterization of the ports (data rates, half/full duplex)
- Setting parameters of the VLANs and multicast services
- Parameterization of the standby connections for a redundant ring link
- Setting of Rapid Spanning Tree parameters
- Parameterization of user administration of SNMP V1, V2c, V3
- Output of statistics information
- Diagnosis of data traffic by means of a parameterizable mirror port with a standard commercial network analyzer
- Loading of new firmware or the configuration data via the network by a TFTP server
- Saving the configuration data or log table via the network on a TFTP server
- Only for SCALANCE X414-3E: Configuration of the IP routing function (static routing, dynamic routing, (OSPF, RIP v1/2) and redundant routing (VRRP))

If faults occur in the network, the SCALANCE X-400 switch can send error messages (traps) to a network management system or also e-mails to a predefined network administrator.

The **remote monitoring (RMON)** offers the following functions: The SCALANCE X-400 switch can collect statistics information according to the RMON groups 1 through 4. These include, for example, fault statistics that are kept for each port. This information can be read out through Web-based management in the statistics sub-area.

■ **Integration**
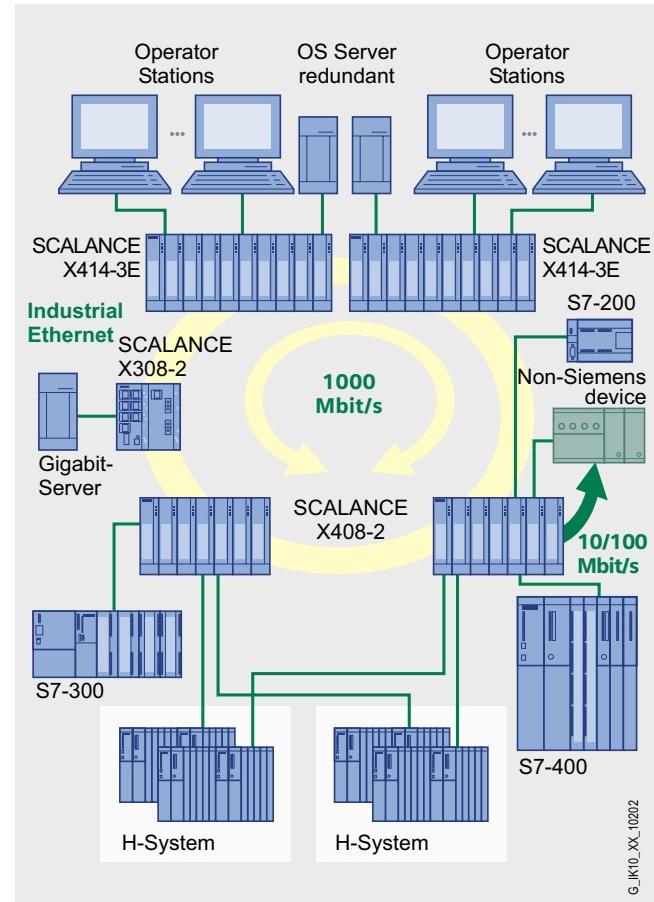
Fault-tolerant system with SCALANCE X-400

PROFINET/Industrial Ethernet
Industrial Ethernet switches

SCALANCE X-400 modular

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■ **Integration** (continued)
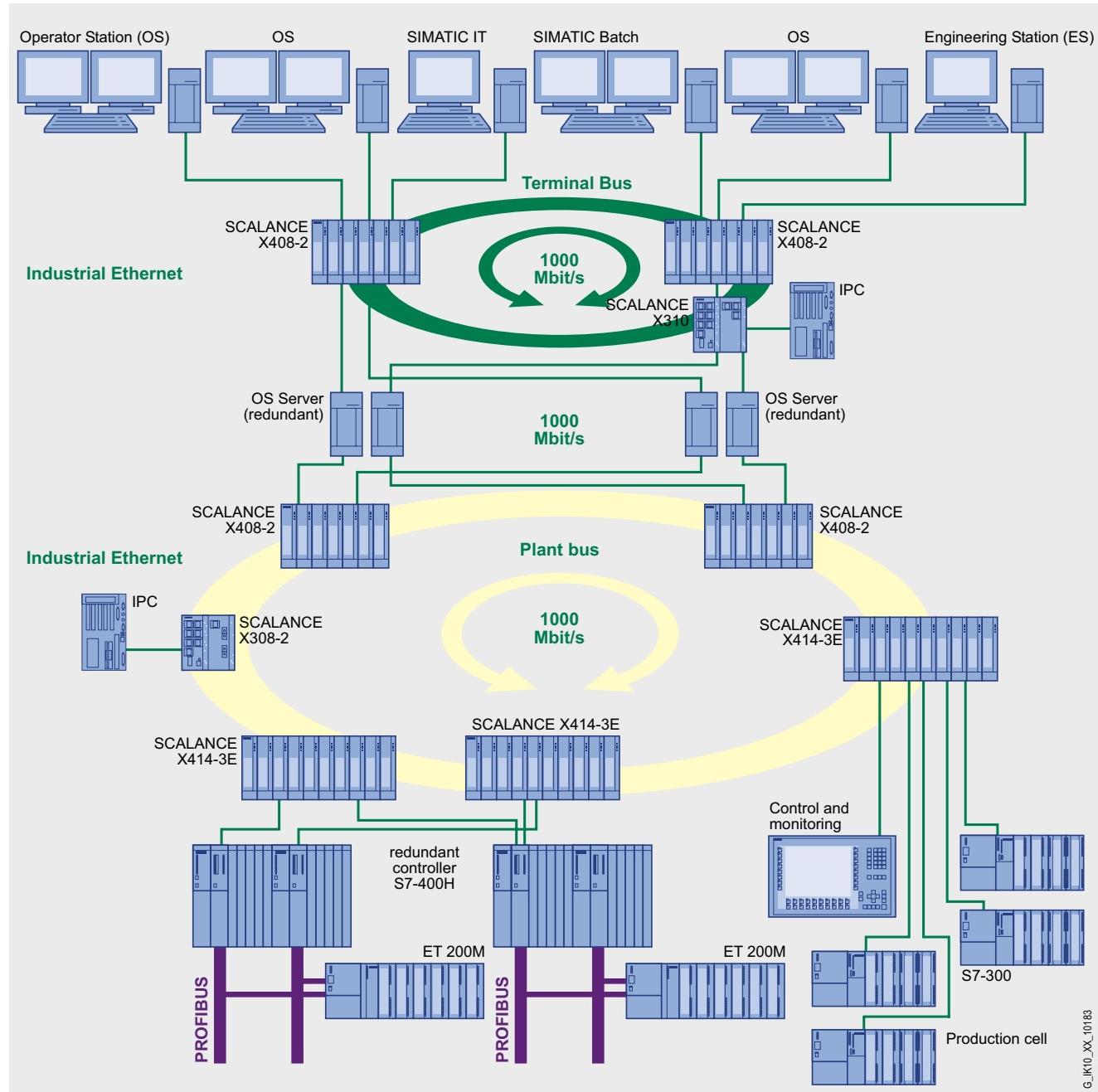
Use of the SCALANCE X-400 switches in a process control system, e.g. PCS 7

In the control room, two SCALANCE X-400 switches are used on the terminal bus. With a higher number of stations, SCALANCE X414-3E switches can be used with extender modules. These are connected together to create an electrical ring with a transfer rate of 1 Gbit/s. Several operator panels are provided and divided between the two switches, so that the system can still be operated if one switch fails. The terminal and plant buses are connected using redundant servers, and also using high-performance Gigabit plugs in the case of SCALANCE X408-2.

The plant bus is designed as an optical ring. It connects three plant sections with the servers:

- SCALANCE X-400 switches without extenders are used for connecting high-availability SIMATIC controllers (H-systems). On failure of an individual controller or switch, the plant section remains functional.
- One SCALANCE X414-3E with extender (high number of ports) is used for the star-format connection of controllers.

▪ Technical specifications

Type	SCALANCE X408-2 NEW	SCALANCE X414-3E
Transfer rate	10/100/1000 Mbit/s	10/100/1000 Mbit/s
Interfaces		
• Communication connection, electrical	4 x RJ45 (10/100/1000 Mbit/s; TP); 4 x RJ45 (10/100 Mbit/s; TP)	In the basic unit: 2 x RJ45 (10/100/1000 Mbit/s; TP); 12 x RJ45 (10/100 Mbit/s; TP); with extender modules: 8 x RJ45 (10/100 Mbit/s; TP) via EM495-8
• Communication connection, optical	Up to 4 x glass FOC with SC sockets (1000 Mbit/s) via MM492-2 or MM492-2LD media modules; or up to 4 x glass FOC with BFOC sockets (100 Mbit/s) via MM491-2 or MM491-2LD media modules	In the basic unit: Up to 2 x glass FOC with SC sockets (1000 Mbit/s) via MM492-2 or MM492-2LD media modules; or up to 4 x glass FOC with BFOC sockets (100 Mbit/s) via MM491-2 or MM491-2LD media modules; with extender modules: Up to 12 x glass FOC with BFOC sockets (100 Mbit/s) via EM496-4 and MM491-2 or MM491-2LD;
• Extender interface	–	EM495-8 or EM496-4
• Connection for supply voltage	1 x 4-pole terminal block	1 x 4-pole terminal block
• Connector for signaling contact	1 x 4-pole terminal block	1 x 4-pole terminal block
• Connection for digital input signals	–	2 x 5-pole terminal block
• Slot for the swap medium	C-PLUG	C-PLUG
Supply voltage	24 V DC (18 V to 32 V)	24 V DC (18 V to 32 V)
Current consumption	< 700 mA	< 2000 mA
Power loss at 24 V DC	15 W (without media modules), < 48 W (maximum configuration)	15 W (without media and extender modules), < 48 W (maximum configuration)
Network extension parameter / TP cable length at 100 Mbit/s		
• 0 - 100 m	IE FC Standard Cable GP with IE FC RJ45 Plug	IE FC Standard Cable GP with IE FC RJ45 Plug
• 0 - 85 m	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug	IE FC Marine/Trailing/Flexible/FRNC Cable with IE FC RJ45 Plug
• 0 - 55 m	IE FC Torsion Cable with IE FC RJ45 Plug	IE FC Torsion Cable with IE FC RJ45 Plug
• 0 - 3000 m	Cable lengths for multi-mode fiber-optic cable at 100 Mbit/s; MM491-2 with glass FOC 62.5/125 µm or 50/125 µm; ≤ 1 dB/km at 1300 nm; ≥ 600 MHz x km	Cable lengths for multi-mode fiber-optic cable at 100 Mbit/s; MM491-2 with glass FOC 62.5/125 µm or 50/125 µm; ≤ 1 dB/km at 1300 nm; ≥ 600 MHz x km
• 0 - 750 m	Cable lengths for multi-mode fiber-optic cable at 1000 Mbit/s; MM492-2 with glass FOC 50/125 µm; ≤ 2.7 dB/km at 850 nm; ≥ 600 MHz x km	Cable lengths for multi-mode fiber-optic cable at 1000 Mbit/s; MM492-2 with glass FOC 50/125 µm; ≤ 2.7 dB/km at 850 nm; ≥ 600 MHz x km
• 0 - 26 km	Cable lengths for single-mode fiber-optic cable at 100 Mbit/s; MM491-2 with glass FOC 10/125 µm or 9/125 µm; ≤ 0.5 dB/km at 1300 nm	Cable lengths for single-mode fiber-optic cable at 100 Mbit/s; MM491-2 with glass FOC 10/125 µm or 9/125 µm; ≤ 0.5 dB/km at 1300 nm
• 0 - 10 km	Cable lengths for single-mode fiber-optic cable at 1000 Mbit/s; MM492-2 LD with glass FOC 10/125 µm or 9/125 µm; ≤ 0.5 dB/km at 1300 nm	Cable lengths for single-mode fiber-optic cable at 1000 Mbit/s; MM492-2 LD with glass FOC 10/125 µm or 9/125 µm; ≤ 0.5 dB/km at 1300 nm

PROFINET/Industrial Ethernet
Industrial Ethernet switches

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SCALANCE X-400 modular

■ **Technical specifications** (continued)

Type	SCALANCE X408-2 NEW	SCALANCE X414-3E
Approvals		
• Radio interference level	EN 61000-6-4 Class A	EN 61000-6-4 Class A
• Interference immunity	EN 61000-6-2	EN 61000-6-2
• ATEX Zone 2	EN 50021	EN 50021
• C-Tick	AS/NZS 2064 (Class A)	AS/NZS 2064 (Class A)
• CE	EN 61000-6-2, EN 61000-6-4	EN 61000-6-2, EN 61000-6-4
• Approvals for use in marine vessels	Available soon	Germanischer Lloyd (GL), American Bureau of Shipping (ABS), Llyods Register of Shipping (LRS), Bureau Veritas (BV), Nippon Kaiji Kyokai (NK), Det Norske Veritas (DNV)
• CuL listing	UL 60950-1, CSA C22.2 No. 60950-1, UL 508, CSA C22.2 No. 14-M91 UL 1604 and 2279 (hazardous location)	UL 60950-1, CSA C22.2 No. 60950-1, UL 508, CSA C22.2 No. 14-M91 UL 1604 and 2279 (hazardous location)
• FM	FM 3611, FM hazardous location	FM 3611, FM hazardous location
Permissible ambient conditions		
• Operating temperature	0 °C to +60 °C	0 °C to +60 °C
• Transport/storage temperature	-40 °C to +80 °C	-40 °C to +80 °C
• Relative humidity during operation	< 95% (non-condensing)	< 95% (non-condensing)
Design		
• Dimensions (W x H x D) in mm	275 x 145 x 117	344 x 145 x 117
• Weight	1.9 kg	3.1 kg
• Assembly	S7-300 sectional rail, DIN rail	S7-300 sectional rail, DIN rail
Degree of protection	IP20	IP20

Ordering data	Order No.		Order No.
Industrial Ethernet Switches SCALANCE X-400		*Accessories*	
Modular Industrial Ethernet switches with integral RJ45 ports for constructing electrical and/or optical Industrial Ethernet networks; integral redundancy manager, IT functions (RSTP, VLAN, etc.), PROFINET IO device, network management over SNMP and web server; C-PLUG included in scope of delivery		**IE FC RJ45 Modular Outlet**	
		FastConnect RJ45 Outlet for Industrial Ethernet with interface for a replaceable insert;	
		• **With 2FE insert**; replaceable insert for 2 x 100 Mbit/s interfaces	**6GK1 901-1BE00-0AA1**
• **SCALANCE X408-2**; 4 x 10/100/1000 Mbit/s and 4 x 10/100 Mbit/s RJ45 ports; 2 x Gigabit/Fast Ethernet media module slots	**6GK5 408-2FD00-2AA2** NEW	• **With 1GE insert**; replaceable insert for 1 x 1000 Mbit/s interfaces	**6GK1 901-1BE00-0AA2**
		IE FC TP Standard Cable GP 4 x 2	**6XV1 870-2E**
• **SCALANCE X414-3E**; 2 x 10/100/1000 Mbit/s and 12 x 10/100 Mbit/s RJ45 ports; 1 x Gigabit-Ethernet and 2 x Fast Ethernet media module slots; 1 x extender interface	**6GK5 414-3FC00-2AA2**	8-core, shielded TP installation cable for connection to IE FC RJ45 Modular Outlet for universal applications; with UL approval; sold by the meter; max. quantity 1000 m, minimum order 20 m	
MM491/MM492 media modules		**IE FC RJ45 Plugs**	
Media modules with 2 ports; 1 Gbit/s, SC connection		RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables	
MM492-2; 1000BaseSX, multi-mode FOC up to 750 m	**6GK5 492-2AL00-8AA2**	**IE FC RJ45 Plug 180**	
MM492-2LD; 1000BaseLX, singlemode FOC up to 10 km	**6GK5 492-2AM00-8AA2**	180° cable outlet; for network components and CPs/CPUs with Industrial Ethernet interface	
Media modules with 2 ports; 100 Mbit/s, BFOC connection		• 1 pack = 1 item	**6GK1 901-1BB10-2AA0**
MM491-2; 100BaseFX, multi-mode FOC up to 3 km	**6GK5 491-2AB00-8AA2**	• 1 pack = 10 items	**6GK1 901-1BB10-2AB0**
		• 1 pack = 50 items	**6GK1 901-1BB10-2AE0**
MM491-2LD; 100BaseFX, long distance, singlemode FOC up to 26 km	**6GK5 491-2AC00-8AA2**	**IE FC RJ45 Plug 145**	
EM495/EM496 extender modules		145° cable outlet; e.g. for SIMOTION and SINAMICS	
Extender modules for SCALANCE X414-3E		• 1 pack = 1 item	**6GK1 901-1BB30-0AA0**
• **EM495-8**; with 8 x 10/100 Mbit/s TP ports	**6GK5 495-8BA00-8AA2**	• 1 pack = 10 items	**6GK1 901-1BB30-0AB0**
		• 1 pack = 50 items	**6GK1 901-1BB30-0AE0**
• **EM496-4**; with 4 slots for 100 Mbit/s media modules	**6GK5 496-4MA00-8AA2**	**C-PLUG**	**6GK1 900-0AB00**
		Swap medium for simple replacement of devices in the event of a fault; for storing configuration or engineering and application data; can be used for SIMATIC NET products with C-PLUG slot	
		Replacement parts	
		CV490 cover set	**6GK5 490-0AA00-0AA2**
		consisting of covers for: 1 x Gbit submodule slot, 1 x 100 Mbit/s submodule slot, 3 x 10/100 Mbit/s TP slot	
		Label sheet	**6GK5 498-0AA00-0AA0**
		10 sheets DIN A4, color: petrol, 10 strips/sheet, pre-perforated for printing with laser printer 10 sheets per pack	
		4-pole and 5-pole terminal set	**6GK5 498-1AA00-0AA0**
		Straight, with locking lug	

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-300

CPU 319F-3 PN/DP

Overview

- The fail-safe CPU with high-performance command processing, large program memory and large quantity structure for demanding applications
- For constructing a fail-safe automation system for plants with increased safety requirements
- Satisfies safety requirements up to SIL 3 acc. to IEC 61508 and up to Cat. 4 acc. to EN 954-1
- Fail-safe I/O modules can be connected decentralized over the integrated PROFINET interface (PROFIsafe) and/or over the integrated PROFIBUS DP interface (PROFIsafe)
- Fail-safe I/O modules of ET200M can also be connected centrally
- Standard modules for non-safety-related applications can be operated centrally and decentralized
- Distributed intelligence in Component Based Automation (CBA) on PROFINET
- Isochronous mode on PROFIBUS
- PROFINET proxy for intelligent devices on PROFIBUS DP in Component Based Automation (CBA)

For operation of the CPU, a micro memory card is required.

Technical specifications

	6ES7 318-3FL00-0AB0
Supply voltages	
Rated value	
• DC 24 V	Yes
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
Current consumption	
Inrush current, typ.	4 A
I^2t	1.2 A²s
Current consumption (in no-load operation), typ.	400 mA
Current consumption (rated value)	1,050 mA
Power loss, typ.	14 W
Memory	
Type of storage	
• RAM	
- integrated	1,400 KByte
- expandable	No
• Load memory	
- pluggable (MMC)	Yes
- pluggable (MMC), max.	8 MByte
Backup	
• present	Yes
• without battery	Yes
CPU/blocks	
DB	
• Number, max.	4,095
• Size, max.	64 KByte
FB	
• Number, max.	2,048
• Size, max.	64 KByte
FC	
• Number, max.	2,048
• Size, max.	64 KByte
OB	
• Size, max.	64 KByte
Nesting depth	
• per priority class	16
• additional within an error OB	4
CPU/processing times	
for bit operations, min.	0.01 µs
for word operations, min.	0.02 µs
for fixed point arithmetic, min.	0.02 µs
for floating point arithmetic, min.	0.1 µs

■ **Technical specifications** (continued)

	6ES7 318-3FL00-0AB0		6ES7 318-3FL00-0AB0
Times/counters and their remanence		Digital channels	
S7 counter		• Inputs	65,536
• Number	2,048	• Outputs	65,536
• Remanence		• Inputs, of which central	1,024
- adjustable	Yes	• Outputs, of which central	1,024
• Counting range		Analog channels	
- adjustable	Yes	• Inputs	4,096
- lower limit	0	• Outputs	4,096
- upper limit	999	• Inputs, of which central	256
IEC counter		• Outputs, of which central	256
• present	Yes	**Hardware config.**	
S7 times		Racks, max.	4
• Number	2,048	Modules per rack, max.	8
• Remanence		Number of DP masters	
- adjustable	Yes	• integrated	2
• Time range		• via CP	4
- lower limit	10 ms	Number of operable FMs and CPs (recommended)	
- upper limit	9,990 s	• FM	8
IEC timer		• CP, point-to-point	8
• present	Yes	• CP, LAN	10
Data areas and their remanence		**Time**	
Flag		Clock	
• Number, max.	8 KByte	• Hardware clock (real-time clock)	Yes
• Remanence available	Yes	• buffered and synchronizable	Yes
• Number of clock memories	8	• Deviation per day, max.	10 s
Data blocks		Operating hours counter	
• Number, max.	4,095	• Number	4
• Size, max.	64 KByte	• remanent	Yes
• Remanence adjustable	Yes	Clock synchronization	
Local data		• supports	Yes
• per priority class, max.	1,024 Byte	• to MPI, Master	Yes
Address area		• to MPI, Slave	Yes
I/O address area		• to DP, Master	Yes
• Inputs	8 KByte	• to DP, Slave	Yes
• Outputs	8 KByte	• in AS, Master	Yes
• of which, distributed		• in AS, Slave	Yes
- Inputs	8 KByte	• on Ethernet via NTP	Yes
- Outputs	8 KByte	**S7 message functions**	
Process image		Number of login stations for message functions, max.	32
• Inputs, adjustable	2 KByte	Process diagnostic messages	Yes
• Outputs, adjustable	2 KByte	simultaneously active Alarm-S blocks, max.	60
• Inputs, preset	1,024 Byte		
• Outputs, preset	1,024 Byte		
Subprocess images			
• Number of subprocess images, max.	1		

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-300

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CPU 319F-3 PN/DP

■ Technical specifications (continued)

	6ES7 318-3FL00-0AB0
Test commissioning functions	
Status/control	
• Status/control variable	Yes
• Number of variables, max.	30
• of which status variable, max.	30
• of which control variable, max.	14
Forcing	
• Forcing	Yes
• Number of variables, max.	10
Status block	Yes
Single step	Yes
Number of breakpoints	2
Diagnostic buffer	
• present	Yes
• Number of entries, max.	500
Communication functions	
PG/OP communication	Yes
Routing	Yes
Global data communication	
• supported	Yes
• Size of GD packets, max.	22 Byte
S7 basic communication	
• supported	Yes
S7 communication	
• supported	Yes
S5-compatible communication	
• supported	Yes
Open IE communication	
• TCP/IP	Yes
- Number of connections, max.	8
- Data length, max.	1,460 Byte
• ISO-on-TCP (RFC1006)	Yes
- Number of connections, max.	8
- Data length, max.	8,192 Byte
• UDP	Yes
- Number of connections, max.	8
- Data length, max.	1,472 Byte
Number of connections	
• overall	32
• usable for PG communication	31
• usable for OP communication	31
• usable for S7 basic communication	30

	6ES7 318-3FL00-0AB0
PROFINET CBA (at set setpoint communication load)	
• Setpoint for the CPU communication load	20%
• Number of remote interconnection partners	32
• Number of functions, master/slave	50
• Total of all master/slave connections	3,000
• Data length of all incoming connections master/slave, max.	24,000 Byte
• Data length of all outgoing connections master/slave, max.	24,000 Byte
• Number of device-internal and PROFIBUS interconnections	1,000
• Data length of device-internal and PROFIBUS interconnections, max.	8,000 Byte
• Data length per connection, max.	1,400 Byte
• Remote interconnections with acyclic transmission	
- Sampling frequency: sampling interval, min.	200 ms
- Number of incoming interconnections	100
- Number of outgoing interconnections	100
- Data length of all incoming interconnections, max.	3,200 Byte
- Data length of all outgoing interconnections, max.	3,200 Byte
- Data length per connection, max.	1,400 Byte
• Remote interconnections with cyclic transmission	
- Transmission frequency: transmission interval, min.	1 ms
- Number of incoming interconnections	300
- Number of outgoing interconnections	300
- Data length of all incoming interconnections, max.	4,800 Byte
- Data length of all outgoing interconnections, max.	4,800 Byte
- Data length per connection, max.	250 Byte
• HMI variables via PROFINET (acyclic)	
- Number of log-in stations for HMI variables (PN OPC/iMap)	3
- HMI variable updating	500 ms
- Number of HMI variables	600
- Data length of all HMI variables, max.	9,600 Byte
• PROFIBUS proxy functionality	
- supported	Yes
- Number of linked PROFIBUS devices	32
- Data length per connection, max.	240 Byte

■ **Technical specifications** (continued)

	6ES7 318-3FL00-0AB0		6ES7 318-3FL00-0AB0
1st interface		DP slave	
isolated	Yes	• Services	
Power supply to interface (15 to 30 V DC), max.	150 mA	- Routing	Yes
Functionality		- Global data communication	No
• MPI	Yes	- S7 basic communication	No
• DP master	Yes	- S7 communication	Yes
• DP slave	Yes	- S7 communication, as client	No
• Point-to-point coupling	No	- S7 communication, as server	Yes
MPI		- direct data exchange (cross traffic)	Yes
• Number of connections	32	- DPV1	No
• Services		• Transmission speeds, max.	12 Mbit/s
- PG/OP communication	Yes	• Transfer memory	
- Routing	Yes	- Inputs	244 Byte
- Global data communication	Yes	- Outputs	244 Byte
- S7 basic communication	Yes	• Address area, max.	32
- S7 communication	Yes	• Useful data per address area, max.	32 Byte
- S7 communication, as client	No	**2nd interface**	
- S7 communication, as server	Yes	isolated	Yes
• Transmission speeds, max.	12 Mbit/s	Power supply to interface (15 to 30 V DC), max.	200 mA
DP master		Functionality	
• Services		• MPI	No
- PG/OP communication	Yes	• DP master	Yes
- Routing	Yes	• DP slave	Yes
- Global data communication	No	• PROFINET IO controller	No
- S7 basic communication	Yes	• PROFINET CBA	No
- S7 communication	Yes	• Point-to-point coupling	No
- S7 communication, as client	No	DP master	
- S7 communication, as server	Yes	• Services	
- equidistance support	Yes	- PG/OP communication	Yes
- SYNC/FREEZE	Yes	- Routing	Yes
- Activation/deactivation of DP slaves	Yes	- Global data communication	No
- DPV1	Yes	- S7 basic communication	Yes
• Transmission speeds, max.	12 Mbit/s	- S7 communication	Yes
• Number of DP slaves, max.	124	- S7 communication, as client	No
• Address area		- S7 communication, as server	Yes
- Inputs, max.	8 KByte	- equidistance support	Yes
- Outputs, max.	8 KByte	- SYNC/FREEZE	Yes
• Useful data per DP slave		- DPV1	Yes
- Inputs, max.	244 Byte	• Transmission speeds, max.	12 Mbit/s
- Outputs, max.	244 Byte	• Number of DP slaves, max.	124
		• Address area	
		- Inputs, max.	8 KByte
		- Outputs, max.	8 KByte
		• Useful data per DP slave	
		- Inputs, max.	244 Byte
		- Outputs, max.	244 Byte

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-300

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CPU 319F-3 PN/DP

Technical specifications (continued)

	6ES7 318-3FL00-0AB0
DP slave	
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- direct data exchange (cross traffic)	Yes
- DPV1	No
• GSD file	The current GSD file can be obtained from: *http://www.siemens.de/profibus-gsd*
• Transmission speeds, max.	12 Mbit/s
• automatic baud rate search	Yes
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address area, max.	32
• Useful data per address area, max.	32 Byte
3rd interface	
isolated	Yes
automatic detection of transmission speed	Yes
Functionality	
• MPI	No
• PROFINET IO controller	Yes
• PROFINET IO device	No
• PROFINET CBA	Yes
• Point-to-point coupling	No
Open IE communication	
• Number of connections, max.	8
PROFINET CBA (at 50 % communication load)	
• Acyclic transmission	Yes
• cyclic transmission	Yes

	6ES7 318-3FL00-0AB0
CPU/programming	
Programming language	
• STEP 7	Yes
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
• CFC	Yes
• GRAPH	Yes
• HiGraph®	Yes
Software libraries	
Nesting levels	8
User program protection/password protection	Yes
Dimensions	
Width	120 mm
Height	125 mm
Depth	130 mm
Weights	
Weight, approx.	1,250 g

Ordering data	Order No.		Order No.
CPU 319F-3 PN/DP Main memory 1.4 MB, power supply 24 V DC, combined MPI/PROFIBUS DP master/slave interface, PROFIBUS DP master/slave interface, Ethernet/PROFINET interface; MMC required	6ES7 318-3FL00-0AB0	**Power supply connector** 10 units, spare part	6ES7 391-1AA00-0AA0
		Labeling strips 10 units, spare part	6ES7 392-2XX00-0AA0
		Label cover 10 units, spare part	6ES7 392-2XY00-0AA0
Distributed Safety V5.4 programming tool *Task:* Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S *Requirement:* STEP 7 V5.3 SP3 and higher		**S7 SmartLabel** Software for automatic labeling of modules based on data of the STEP 7 project	2XV9 450-1SL01-0YX0
		Labeling sheets for machine inscription For 16-channel signal modules, DIN A4, for printing with laser printer; 10 units	
• Floating license	6ES7 833-1FC02-0YA5	• petrol	6ES7 392-2AX00-0AA0
• Software Update Service	6ES7 833-1FC00-0YX2	• light-beige	6ES7 392-2BX00-0AA0
Distributed Safety Upgrade From V5.x to V5.4; floating license for 1 user	6ES7 833-1FC02-0YE5	• yellow	6ES7 392-2CX00-0AA0
		• red	6ES7 392-2DX00-0AA0
Micro Memory Card		For 32-channel signal modules, DIN A4, for printing with laser printer; 10 units	
• 64 KB	6ES7 953-8LF20-0AA0	• petrol	6ES7 392-2AX10-0AA0
• 128 KB	6ES7 953-8LG11-0AA0	• light-beige	6ES7 392-2BX10-0AA0
• 512 KB	6ES7 953-8LJ20-0AA0	• yellow	6ES7 392-2CX10-0AA0
• 2 MB	6ES7 953-8LL20-0AA0	• red	6ES7 392-2DX10-0AA0
• 4 MB	6ES7 953-8LM20-0AA0	**Manual "Communication for SIMATIC S7-300/-400"**	
• 8 MB	6ES7 953-8LP20-0AA0	• German	6ES7 398-8EA00-8AA0
MPI cable For connecting SIMATIC S7 and the PG through MPI; 5 m in length	6ES7 901-0BF00-0AA0	• English	6ES7 398-8EA00-8BA0
		• French	6ES7 398-8EA00-8CA0
Slot number plates	6ES7 912-0AA00-0AA0	• Spanish	6ES7 398-8EA00-8DA0
S7-300 manual Design, CPU data, module data, instruction list		• Italian	6ES7 398-8EA00-8EA0
		SIMATIC S7 demo case With mounting components for mounting S7-200 and S7-300	6ES7 910-3AA00-0XA0
• German	6ES7 398-8FA10-8AA0		
• English	6ES7 398-8FA10-8BA0		
• French	6ES7 398-8FA10-8CA0		
• Spanish	6ES7 398-8FA10-8DA0		
• Italian	6ES7 398-8FA10-8EA0		
SIMATIC Manual Collection Electronic manuals on DVD, multilingual: S7-200, S7-300, C7, S7-400, SIMATIC DP (distributed I/O), SIMATIC PC, SIMATIC PG (programming device), STEP 7, Engineering Tools, Runtime Software, SIMATIC PCS 7, SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication), SIMATIC Machine Vision, SIMATIC Sensors	6ES7 998-8XC01-8YE0		
SIMATIC Manual Collection update service for 1 year Current "Manual Collection" DVD and the three subsequent updates	6ES7 998-8XC01-8YE2		

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Ordering data	Order No.		Order No.
PROFIBUS bus components		*PROFINET bus components*	
PROFIBUS DP bus connector RS 485		**IE FC TP Standard Cable GP 2x2**	**6XV1 840-2AH10**
• With 90° cable outlet, max. transmission rate 12 Mbit/s		4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/IE FC RJ45 Plug; PROFINET-compatible; with UL approval; Sold by the meter	
- Without PG interface	**6ES7 972-0BA12-0XA0**		
- With PG interface	**6ES7 972-0BB12-0XA0**	**FO Standard Cable GP (50/125)**	**6XV1 873-2A**
• With 90° cable outlet for Fast-Connect connection system, max. transmission rate 12 Mbit/s		Standard cable, splittable, UL approval, sold by the meter	
- Without PG interface	**6ES7 972-0BA50-0XA0**	**SCALANCE X204-2 Industrial Ethernet switch**	**6GK5 204-2BB00-2AA3**
- With PG interface	**6ES7 972-0BB50-0XA0**	Industrial Ethernet switches with integral SNMP access, Web diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; four 10/100 Mbit/s RJ45 ports and two FO ports	
• With axial cable outlet for SIMATIC OP, for connecting to PPI, MPI, PROFIBUS	**6GK1 500-0EA02**		
PROFIBUS Fast Connect bus cable	**6XV1 830-0EH10**	**IE FC RJ45 Plugs**	
Standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m		RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables	
RS 485 repeater for PROFIBUS	**6ES7 972-0AA01-0XA0**	**IE FC RJ45 Plug 145**	
Data transfer rate up to 12 Mbit/s; 24 V DC; IP 20 housing		145° cable outlet	
		• 1 unit	**6GK1 901-1BB30-0AA0**
		• 10 units	**6GK1 901-1BB30-0AB0**
		• 50 units	**6GK1 901-1BB30-0AE0**
		IE FC RJ45 Plug 180	
		180° cable outlet	
		• 1 unit	**6GK1 901-1BB10-2AA0**
		• 10 units	**6GK1 901-1BB10-2AB0**
		• 50 units	**6GK1 901-1BB10-2AE0**
		PROFIBUS/PROFINET bus components	See Catalogs IK PI, CA 01
		For establishing MPI/PROFIBUS/ PROFINET communication	

■ Overview

- CPUs for high demands in the mid-level performance range
- Applicable for plants with additional demands on programming scope and processing speed
- Integrated PROFINET functions in CPU 414-3 PN/DP

■ Technical specifications

	6ES7 414-3EM05-0AB0
Product status	
Hardware product status	1
Firmware version	V 5.0
associated programming package	From STEP7 V 5.4 SP1 or higher
Voltages and currents	
Feeding of external buffer voltage to CPU	5 to 15 V DC
Current consumption	
from backplane bus DC 5 V, max.	1.4 A
from interface DC 5 V, max.	90 mA; At each DP interface
Power loss, typ.	5.5 W
Backup battery	
• Buffer current, typ.	125 µA; Valid up to 40 C
• Buffer current, max.	550 µA
Memory	
Type of storage	
• RAM	
- integrated (for program)	1.4 MByte
- integrated (for data)	1.4 MByte
- expandable	No
• Load memory	
- expandable FEPROM	Yes
- expandable FEPROM, max.	64 MByte
- integrated RAM, max.	512 KByte
- expandable RAM	Yes
- expandable RAM, max.	64 MByte
Backup	
• present	Yes
• with battery	Yes; All data
• without battery	No
CPU/blocks	
DB	
• Number, max.	6,000; Number range: 1 to 16,000
• Size, max.	64 KByte
FB	
• Number, max.	3,000; Number range: 0 to 7,999
• Size, max.	64 KByte
FC	
• Number, max.	3,000; Number range: 0 to 7,999
• Size, max.	64 KByte
OB	
• Number, max.	See Instruction List
• Size, max.	64 KByte
• Number of isochronous mode Obs	3
Nesting depth	
• per priority class	24
• additional within an error OB	1
CPU/processing times	
for bit operations, min.	45 ns
for word operations, min.	45 ns
for fixed point arithmetic, min.	45 ns
for floating point arithmetic, min.	135 ns

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-400

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CPU 414-3 PN/DP

■ **Technical specifications** (continued)

	6ES7 414-3EM05-0AB0
Times/counters and their remanence	
S7 counter	
• Number	2,048
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	2,047
- preset	From Z 0 to Z 7
• Counting range	
- lower limit	0
- upper limit	999
IEC counter	
• present	Yes
• Type	SFB
S7 times	
• Number	2,048
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	2,047
- preset	No timers retentive
• Time range	
- lower limit	10 ms
- upper limit	9,990 s
IEC timer	
• present	Yes
• Type	SFB
Data areas and their remanence	
remanent data area, total	Total working and load memory (with backup battery)
Flag	
• Number, max.	8 KByte
• Remanence available	Yes
• Number of clock memories	8; (in 1 memory byte)
Address area	
I/O address area	
• Inputs	8 KByte
• Outputs	8 KByte
• of which, distributed	
- MPI/DPinterface, inputs	2 KByte
- MPI/DP interface, outputs	2 KByte
- DP interface, inputs	6 KByte
- DP interface, outputs	6 KByte
- PN interface, inputs	8 KByte
- PN interface, outputs	8 KByte
Process image	
• Inputs, adjustable	8 KByte
• Outputs, adjustable	8 KByte
• Inputs, preset	256 Byte
• Outputs, preset	256 Byte
• consistent data, max.	244 Byte
• Access to consistent data in process image	Yes
Subprocess images	
• Number of subprocess images, max.	15

	6ES7 414-3EM05-0AB0
Digital channels	
• Inputs	65,536
• Outputs	65,536
• Inputs, of which central	65,536
• Outputs, of which central	65,536
Analog channels	
• Inputs	4,096
• Outputs	4,096
• Inputs, of which central	4,096
• Outputs, of which central	4,096
Hardware config.	
connectable OPs	31
Central devices, max.	1
Expansion devices, max.	21
Multicomputing	Yes; 4 CPUs max. (with UR1 or UR2)
IM	
• Number of connectable IMs (total), max.	6
• Number of connectable IM 460s, max.	6
• Number of connectable IM 463s, max.	4; IM 463-2
Number of DP masters	
• integrated	1
• via IM 467	4
• via CP	10; CP 443-5 extended
• Mixed mode IM + CP permitted	No; IM 467 not suitable for use with CP 443-5 Ext. and CP 443-1 EX4x (in PNIO mode)
• via interface module	1; IF964-DP
• Number of pluggable S5 modules (via adapter capsule in central device), max.	6
Number of IO controllers	
• integrated	1
• via CP	4; Via CP 443-1 EX 41 in PN operation Max. 4 in central controller
Number of operable FMs and CPs (recommended)	
• FM	Limited due to number of slots and number of connections
• CP, point-to-point	Limited due to number of slots and number of connections
• PROFIBUS and Ethernet CPs	14; Of which 10 CP/IM max. as DP master and PN controller
Time	
Clock	
• Hardware clock (real-time clock)	Yes
• buffered and synchronizable	Yes
• Resolution	1 ms
Operating hours counter	
• Number	8
Clock synchronization	
• supports	Yes
• to MPI, Master	Yes
• to MPI, Slave	Yes
• to DP, Master	Yes
• to DP, Slave	Yes
• in AS, Master	Yes
• in AS, Slave	Yes
• on Ethernet via NTP	Yes; As client
• to IF 964 DP	Yes

Technical specifications (continued)

	6ES7 414-3EM05-0AB0
S7 message functions	
Number of login stations for message functions, max.	31; Max. 31 with alarm_S and alarm_D (OP's); max. 8 with alarm_8 and alarm_P (e.g. WinCC)
Symbol-related messages	Yes
Number of messages	
• overall, max.	512
Block related messages	Yes
Alarm 8-blocks	Yes
Instrumentation & control messages	Yes
Test commissioning functions	
Status/control	
• Status/control variable	Yes
Forcing	
• Forcing	Yes
Status block	Yes
Single step	Yes
Number of breakpoints	4
Diagnostic buffer	
• present	Yes
• Number of entries, max.	3,200
• adjustable	Yes
• preset	120
Communication functions	
PG/OP communication	Yes
Routing	Yes
Global data communication	
• supported	Yes
• Size of GD packets, max.	54 Byte
S7 basic communication	
• supported	Yes
• Useful data per job, max.	76 Byte
S7 communication	
• supported	Yes
• Useful data per job, max.	64 KByte
S5-compatible communication	
• supported	Yes; (via CP -max. 10- and FC AG_SEND and FC AG_RECV)
• Useful data per job, max.	8 KByte
Standard communication (FMS)	
• supported	Yes; Via CP and loadable FB
Web server	Yes
Open IE communication	
• TCP/IP	Yes
- Number of connections, max.	32
- Data length, max.	32 KByte
• ISO-on-TCP (RFC1006)	Yes
- Number of connections, max.	32
- Data length, max.	32 KByte; 1452 bytes via CP 443-1 Adv.
• UDP	Yes
- Number of connections, max.	32
- Data length, max.	1,472 Byte

	6ES7 414-3EM05-0AB0
Number of connections	
• overall	32
PROFINET CBA (at set setpoint communication load)	
• Number of remote interconnection partners	32
• Number of functions, master/slave	150
• Total of all master/slave connections	4,500
• Data length of all incoming connections master/slave, max.	45,000 Byte
• Data length of all outgoing connections master/slave, max.	45,000 Byte
• Number of device-internal and PROFIBUS interconnections	1,000
• Data length of device-internal and PROFIBUS interconnections, max.	16,000 Byte
• Data length per connection, max.	2,000 Byte
• Remote interconnections with acyclic transmission	
- Sampling frequency: sampling interval, min.	200 ms; Depending on preset communcation load, number of interconnections and data length used
- Number of incoming interconnections	250
- Number of outgoing interconnections	250
- Data length of all incoming interconnections, max.	8,000 Byte
- Data length of all outgoing interconnections, max.	8,000 Byte
- Data length per connection, max.	2,000 Byte
• Remote interconnections with cyclic transmission	
- Transmission frequency: transmission interval, min.	1 ms; Depending on preset communication load, number of interconnections and data length used
- Number of incoming interconnections	300
- Number of outgoing interconnections	300
- Data length of all incoming interconnections, max.	4,800 Byte
- Data length of all outgoing interconnections, max.	4,800 Byte
- Data length per connection, max.	250 Byte
• HMI variables via PROFINET (acyclic)	
- Number of log-in stations for HMI variables (PN OPC/iMap)	2x PN OPC/1x iMap
- HMI variable updating	500 ms
- Number of HMI variables	1,000
- Data length of all HMI variables, max.	32,000 Byte
• PROFIBUS proxy functionality	
- supported	Yes; 32 PROFIBUS slaves max. connectable
- Data length per connection, max.	240 Byte; Slave-dependent

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-400

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CPU 414-3 PN/DP

■ **Technical specifications** (continued)

	6ES7 414-3EM05-0AB0		6ES7 414-3EM05-0AB0
1st interface		**2nd interface**	
Physics	RS 485 / PROFIBUS + MPI	Physics	Ethernet
isolated	Yes	isolated	Yes
Functionality		Functionality	
• MPI	Yes	• DP master	No
• DP master	Yes	• DP slave	No
• DP slave	Yes	• PROFINET IO controller	Yes
MPI		• PROFINET CBA	Yes
• Number of connections	32; If a diagnostic repeater is used on the line, the number of connection resources on the line is reduced by 1	• Point-to-point coupling	No
		PROFINET CBA	
		• Acyclic transmission	Yes
		• cyclic transmission	Yes
• Services		PROFINET IO controller	
- PG/OP communication	Yes	• Services	
- Routing	Yes	- PG/OP communication	Yes
- Global data communication	Yes	- Routing	Yes; Routing of PG functions
- S7 basic communication	Yes	- S7 communication	Yes
- S7 communication	Yes	- open IE communication	Yes
• Transmission speeds, max.	12 Mbit/s	• Transmission rate, min.	10 Mbit/s
DP master		• Transmission speed, max.	100 Mbit/s
• Number of connections, max.	16	• Number of connectable IO devices, max.	256
• Services		• Updating time	250 µs to 512 ms; minimum value dependent on preset communication share for PROFINET IO, of number of IO devices and number of configured user data.
- PG/OP communication	Yes		
- Routing	Yes		
- S7 basic communication	Yes		
- S7 communication	Yes		
- equidistance support	Yes		
- Activation/deactivation of DP slaves	Yes		
- direct data exchange (cross traffic)	Yes	• Address area	
		- Inputs, max.	8 KByte
• Transmission speeds, max.	12 Mbit/s	- Outputs, max.	8 KByte
• Number of DP slaves, max.	32	• Useful data consistency, max.	255 Byte; Including user data attendant
• Address area		**3rd interface**	
- Inputs, max.	2 KByte	Type of interfaces	Pluggable interface module (IF)
- Outputs, max.	2 KByte		
• Useful data per DP slave		pluggable interface module	IF 964-DP (MLFB: 6ES7964-2AA04-0AB0)
- Inputs, max.	244 Byte		
- Outputs, max.	244 Byte	Physics	RS 485/Profibus
DP slave		isolated	Yes
• Number of connections	16	power supply to interface (15 to 30 V DC), max.	150 mA; 150 mA maximum
• Services		Number of connection resources	16
- Routing	Yes	Functionality	
- Status/control	Yes	• MPI	No
- Programming	Yes	• DP slave	Yes
• Transmission speeds, max.	12 Mbit/s	• DP master	Yes
• Transfer memory			
- Inputs	244 Byte		
- Outputs	244 Byte		
• Address area, max.	32; Virtual slots		
• Useful data per address area, max.	32 Byte		
• Useful data per address area, of which consistent, max.	32 Byte		

Technical specifications (continued)

	6ES7 414-3EM05-0AB0
DP master	
• Number of connections, max.	16
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	Yes
- S7 communication	Yes
- Equidistance support	Yes
- SYNC/FREEZE	Yes
- Activation/deactivation of DP slaves	Yes
- Direct data exchange	Yes
• Transmission rate, max.	12 Mbit/s
• Number of DP slaves, max.	96
• Address area	
- Inputs, max.	6 KByte
- Outputs, max.	6 KByte
• Useful data per DP slave	
- Useful data per DP slave, max.	244 Byte
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
- Slots, max.	244
- per slot, max.	128 Byte
DP slave	
• Number of connections	16
• Services	
- Routing	Yes
- Programming	Yes
- Status/control	Yes
• GSD file	*http://support.automation. siemens.com/WW/view/ de/113652*
• Transmission rate, max.	12 Mbit/s
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address range, max.	32
• Useful data per address area, max.	32 Byte
• Useful data per address area, of which consistent, max.	32 Byte

	6ES7 414-3EM05-0AB0
Isochronous mode	
Useful data per isochronoous slave, max.	244 Byte
equidistance	Yes
shortest clock pulse	1 ms; Without use of SFC 126 and 127 up to 0.5 ms
CiR configuration in RUN	
CiR synchronization time, basic load	100 ms
CiR synchronization time, time per I/O slave	80 µs
CPU/programming	
Configuration software	
• STEP 7	Yes
Programming language	
• STEP 7	Yes
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
• CFC	Yes
• GRAPH	Yes
• HiGraph®	Yes
Nesting levels	7
User program protection/password protection	Yes
Dimensions	
Width	50 mm
Height	290 mm
Depth	219 mm
Dimensions	
Required slots	2
Weights	
Weight, approx.	900 g

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-400

2

CPU 414-3 PN/DP

Ordering data	Order No.		Order No.
CPU 414-3 PN/DP	6ES7 414-3EM05-0AB0	**Manual "SIMATIC S7-400 programmable controller"** incl. instruction list	
Main memory 2.8 MB, power supply 24 V DC, MPI/PROFIBUS DP master interface, PROFINET interface, slot for memory card, module slot for 1 IF module, incl. slot number labels		• German	6ES7 498-8AA05-8AA0
		• English	6ES7 498-8AA05-8BA0
		• French	6ES7 498-8AA05-8CA0
Memory Card RAM		• Spanish	6ES7 498-8AA05-8DA0
• 64 KB	6ES7 952-0AF00-0AA0	• Italian	6ES7 498-8AA05-8EA0
• 256 KB	6ES7 952-1AH00-0AA0	**S7-400 operation list**	
• 1 MB	6ES7 952-1AK00-0AA0	• German	6ES7 498-8AA05-8AN0
• 2 MB	6ES7 952-1AL00-0AA0	• English	6ES7 498-8AA05-8BN0
• 4 MB	6ES7 952-1AM00-0AA0	• French	6ES7 498-8AA05-8CN0
• 8 MB	6ES7 952-1AP00-0AA0	• Spanish	6ES7 498-8AA05-8DN0
• 16 MB	6ES7 952-1AS00-0AA0	• Italian	6ES7 498-8AA05-8EN0
• 64 MB	6ES7 952-1AY00-0AA0	**Manual "Communication for SIMATIC S7-300/-400"**	
FEPROM memory card		• German	6ES7 398-8EA00-8AA0
• 64 KB	6ES7 952-0KF00-0AA0	• English	6ES7 398-8EA00-8BA0
• 256 KB	6ES7 952-0KH00-0AA0	• French	6ES7 398-8EA00-8CA0
• 1 MB	6ES7 952-1KK00-0AA0	• Spanish	6ES7 398-8EA00-8DA0
• 2 MB	6ES7 952-1KL00-0AA0	• Italian	6ES7 398-8EA00-8EA0
• 4 MB	6ES7 952-1KM00-0AA0	**SIMATIC Manual Collection**	6ES7 998-8XC01-8YE0
• 8 MB	6ES7 952-1KP00-0AA0	Electronic manuals on DVD, five languages: S7-200/300/400, C7, LOGO!, SIMATIC DP, PC, PG, STEP 7, engineering software, runtime software, PCS 7, SIMATIC HMI, SIMATIC NET	
• 16 MB	6ES7 952-1KS00-0AA0		
• 32 MB	6ES7 952-1KT00-0AA0		
• 64 MB	6ES7 952-1KY00-0AA0		
MPI cable	6ES7 901-0BF00-0AA0	**SIMATIC Manual Collection update service for 1 year**	6ES7 998-8XC01-8YE2
For connecting SIMATIC S7 and the PG through MPI; 5 m in length		Current "Manual Collection" DVD and the three subsequent updates	
IF 964-DP interface module	6ES7 964-2AA04-0AB0	**Brochure "SIMATIC S7-400 programmable controller - Design and application"**	
To connect an additional DP line; for CPU 414-3, CPU 414-3 PN/DP, CPU 416-3, CPU 416-3 PN/DP, CPU 417-4		• German	6ES7 498-8AA00-8AB0
Slot number plates	6ES7 912-0AA00-0AA0	• English	6ES7 498-8AA00-8BB0
1 set (spare part)			

■ **Ordering data**

	Order No.		Order No.
PROFIBUS bus components		*PROFINET bus components*	
RS 485 bus connector with 90° cable outlet		**IE FC TP Standard Cable GP 2x2**	6XV1 840-2AH10
Max. transmission rate 12 Mbit/s		4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/ IE FC RJ45 Plug; PROFINET-compatible; with UL approval;	
• Without PG interface	**6ES7 972-0BA12-0XA0**		
• With PG interface	**6ES7 972-0BB12-0XA0**	Sold by the meter	
RS 485 bus connector with angled cable outlet		**FO Standard Cable GP (50/125)**	6XV1 873-2A
Max. transmission rate 12 Mbit/s		Standard cable, splittable, UL approval, sold by the meter	
• Without PG interface	**6ES7 972-0BA41-0XA0**		
• With PG interface	**6ES7 972-0BB41-0XA0**	**SCALANCE X204-2 Industrial Ethernet switch**	6GK5 204-2BB00-2AA3
RS 485 bus connector with 90° cable outlet for FastConnect system		Industrial Ethernet switches with integral SNMP access, Web diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; four 10/100 Mbit/s RJ45 ports and two FO ports	
Max. transmission rate 12 Mbit/s			
• Without PG interface	**6ES7 972-0BA50-0XA0**		
• With PG interface	**6ES7 972-0BB50-0XA0**		
RS 485 bus connector with axial cable outlet	**6GK1 500-0EA02**	**IE FC RJ45 Plugs**	
For SIMATIC OP, for connection to PPI, MPI, PROFIBUS		RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables	
PROFIBUS FastConnect bus cable	**6XV1 830-0EH10**		
Standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m		**IE FC RJ45 plug 180**	
		180° cable outlet	
RS 485 repeater for PROFIBUS	**6ES7 972-0AA01-0XA0**	• 1 unit	**6GK1 901-1BB10-2AA0**
Data transfer rate up to 12 Mbit/s; 24 V DC; IP 20 housing		• 10 units	**6GK1 901-1BB10-2AB0**
		• 50 units	**6GK1 901-1BB10-2AE0**
		PROFIBUS/PROFINET bus components	See Catalogs IK PI, CA 01
		For establishing MPI/PROFIBUS/ PROFINET communication	

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-400

2

CPU 416-3 PN/DP

■ Overview

- High-performance CPUs in the high-end performance range
- Applicable for plants with high requirements in the high-end performance range
- Integrated PROFINET functions in CPU 416-3 PN/DP

■ Technical specifications

	6ES7 416-3ER05-0AB0
Product status	
Firmware version	V 5.0
associated programming package	From STEP7 V 5.4 SP1 or higher
Voltages and currents	
Feeding of external buffer voltage to CPU	5 to 15 V DC
Current consumption	
from backplane bus DC 5 V, max.	1.4 A
from interface DC 5 V, max.	90 mA; At each DP interface
Power loss, typ.	5.5 W
Backup battery	
• Buffer current, typ.	125 µA; Valid up to 40 C
• Buffer current, max.	550 µA
Memory	
Type of storage	
• RAM	
- integrated (for program)	5.6 MByte
- integrated (for data)	5.6 MByte
- expandable	No
• Load memory	
- expandable FEPROM	Yes; With Memory Card (FLASH)
- expandable FEPROM, max.	64 MByte
- integrated RAM, max.	1 MByte
- expandable RAM	Yes; With Memory Card (RAM)
- expandable RAM, max.	64 MByte
Backup	
• present	Yes
• with battery	Yes
• without battery	No
CPU/blocks	
DB	
• Number, max.	10,000; Number range: 1 to 16,000
• Size, max.	64 KByte
FB	
• Number, max.	5,000; Number range: 0 to 7,999
• Size, max.	64 KByte
FC	
• Number, max.	5,000; Number range: 0 to 7,999
• Size, max.	64 KByte
OB	
• Number, max.	See Instruction List
• Size, max.	64 KByte
• Number of isochronous mode Obs	4
Nesting depth	
• per priority class	24
• additional within an error OB	2
CPU/processing times	
for bit operations, min.	30 ns
for word operations, min.	30 ns
for fixed point arithmetic, min.	30 ns
for floating point arithmetic, min.	90 ns

Technical specifications (continued)

	6ES7 416-3ER05-0AB0
Times/counters and their remanence	
S7 counter	
• Number	2,048
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	2,047
- preset	From Z 0 to Z 7
• Counting range	
- lower limit	0
- upper limit	999
IEC counter	
• present	Yes
• Type	SFB
S7 times	
• Number	2,048
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	2,047
- preset	No timers retentive
• Time range	
- lower limit	10 ms
- upper limit	9,990 s
IEC timer	
• present	Yes
• Type	SFB
Data areas and their remanence	
remanent data area, total	Total working and load memory (with backup battery)
Flag	
• Number, max.	16 KByte; Size of bit memory addess area
• Remanence available	Yes
• Number of clock memories	8; (in 1 memory byte)
Address area	
I/O address area	
• Inputs	16 KByte
• Outputs	16 KByte
• of which, distributed	
- MPI/DPinterface, inputs	2 KByte
- MPI/DP interface, outputs	2 KByte
- DP interface, inputs	8 KByte
- DP interface, outputs	8 KByte
- PN interface, inputs	8 KByte
- PN interface, outputs	8 KByte
Process image	
• Inputs, adjustable	16 KByte
• Outputs, adjustable	16 KByte
• Inputs, preset	512 Byte
• Outputs, preset	512 Byte
• consistent data, max.	244 Byte
• Access to consistent data in process image	Yes
Subprocess images	
• Number of subprocess images, max.	15

	6ES7 416-3ER05-0AB0
Digital channels	
• Inputs	131,072
• Outputs	131,072
• Inputs, of which central	131,072
• Outputs, of which central	131,072
Analog channels	
• Inputs	8,192
• Outputs	8,192
• Inputs, of which central	8,192
• Outputs, of which central	8,192
Hardware config.	
connectable OPs	63
Central devices, max.	1
Expansion devices, max.	21
Multicomputing	Yes; 4 CPUs max. (with UR1 or UR2)
IM	
• Number of connectable IMs (total), max.	6
• Number of connectable IM 460s, max.	6
• Number of connectable IM 463s, max.	4; IM 463-2
Number of DP masters	
• integrated	1
• via IM 467	4
• via CP	10; CP 443-5 Ext.
• Mixed mode IM + CP permitted	No; IM 467 not suitable for use with CP 443-5 Ext. and CP 443-1 EX4x (in PNIO mode)
• via interface module	1; IF 964-DP
• Number of pluggable S5 modules (via adapter capsule in central device), max.	6
Number of IO controllers	
• integrated	1
• via CP	4; Via CP 443-1 EX41 in PN operation: 4 max. in central unit
Number of operable FMs and CPs (recommended)	
• FM	Limited due to number of slots and number of connections
• CP, point-to-point	Limited due to number of slots and number of connections
• PROFIBUS and Ethernet CPs	14; Of which 10 CP/IM max. as DP master and PN controller
Time	
Clock	
• Hardware clock (real-time clock)	Yes
• buffered and synchronizable	Yes
• Resolution	1 ms
Operating hours counter	
• Number	8
Clock synchronization	
• supports	Yes
• to MPI, Master	Yes
• to MPI, Slave	Yes
• to DP, Master	Yes
• to DP, Slave	Yes
• in AS, Master	Yes
• in AS, Slave	Yes
• on Ethernet via NTP	Yes; As client
• to IF 964 DP	Yes

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-400

2

CPU 416-3 PN/DP

■ **Technical specifications** (continued)

	6ES7 416-3ER05-0AB0
S7 message functions	
Number of login stations for message functions, max.	63; Max. 63 with alarm_S and alarm_D (OP's); max. 12 with alarm_8 and alarm_P (e.g. WinCC)
Symbol-related messages	Yes
Number of messages	
• overall, max.	1,024
Block related messages	Yes
Alarm 8-blocks	Yes
Instrumentation & control messages	Yes
Test commissioning functions	
Status/control	
• Status/control variable	Yes
Forcing	
• Forcing	Yes
Status block	Yes
Single step	Yes
Number of breakpoints	4
Diagnostic buffer	
• present	Yes
• Number of entries, max.	3,200
• adjustable	Yes
• preset	120
Communication functions	
PG/OP communication	Yes
Routing	Yes
Global data communication	
• supported	Yes
• Size of GD packets, max.	54 Byte
S7 basic communication	
• supported	Yes
• Useful data per job, max.	76 Byte
S7 communication	
• supported	Yes
• Useful data per job, max.	64 KByte
S5-compatible communication	
• supported	Yes; (via CP -max. 10- and FC AG_SEND and FC AG_RECV)
• Useful data per job, max.	8 KByte
Standard communication (FMS)	
• supported	Yes; Via CP and loadable FB
Web server	Yes; Read-only function
Open IE communication	
• TCP/IP	Yes
- Number of connections, max.	64
- Data length, max.	32 KByte
• ISO-on-TCP (RFC1006)	Yes
- Number of connections, max.	64
- Data length, max.	32 KByte; 1452 bytes via CP 443-1 Adv.
• UDP	Yes
- Number of connections, max.	64
- Data length, max.	1,472 Byte
Number of connections	
• overall	64

	6ES7 416-3ER05-0AB0
PROFINET CBA (at set setpoint communication load)	
• Number of remote interconnection partners	32
• Number of functions, master/slave	150
• Total of all master/slave connections	6,000
• Data length of all incoming connections master/slave, max.	65,000 Byte
• Data length of all outgoing connections master/slave, max.	65,000 Byte
• Number of device-internal and PROFIBUS interconnections	1,000
• Data length of device-internal and PROFIBUS interconnections, max.	16,000 Byte
• Data length per connection, max.	2,000 Byte
• Remote interconnections with acyclic transmission	
- Sampling frequency: sampling interval, min.	200 ms; Depending on preset communcation load, number of interconnections and data length used
- Number of incoming interconnections	500
- Number of outgoing interconnections	500
- Data length of all incoming interconnections, max.	16,000 Byte
- Data length of all outgoing interconnections, max.	16,000 Byte
- Data length per connection, max.	2,000 Byte
• Remote interconnections with cyclic transmission	
- Transmission frequency: transmission interval, min.	1 ms; Depending on preset communication load, number of interconnections and data length used
- Number of incoming interconnections	300
- Number of outgoing interconnections	300
- Data length of all incoming interconnections, max.	4,800 Byte
- Data length of all outgoing interconnections, max.	4,800 Byte
- Data length per connection, max.	250 Byte
• HMI variables via PROFINET (acyclic)	
- Number of log-in stations for HMI variables (PN OPC/iMap)	2x PN OPC/1x iMap
- HMI variable updating	500 ms
- Number of HMI variables	1,500
- Data length of all HMI variables, max.	48,000 Byte
• PROFIBUS proxy functionality	
- supported	Yes; 32 PROFIBUS slaves max. connectable
- Data length per connection, max.	240 Byte; Slave-dependent
1st interface	
Physics	RS 485 / PROFIBUS + MPI
isolated	Yes
Functionality	
• MPI	Yes
• DP master	Yes
• DP slave	Yes

■ **Technical specifications** (continued)

	6ES7 416-3ER05-0AB0
MPI	
• Number of connections	44
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	Yes
- S7 basic communication	Yes
- S7 communication	Yes
• Transmission speeds, max.	12 Mbit/s
DP master	
• Number of connections, max.	32; If a diagnostic repeater is used on the line, the number of connection resources on the line is reduced by 1
• Services	
- PG/OP communication	Yes
- Routing	Yes
- S7 basic communication	Yes
- S7 communication	Yes
- equidistance support	Yes
- Activation/deactivation of DP slaves	Yes
- direct data exchange (cross traffic)	Yes
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	32
• Address area	
- Inputs, max.	2 KByte
- Outputs, max.	2 KByte
• Useful data per DP slave	
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
DP slave	
• Number of connections	32
• Services	
- Routing	Yes; When interface active
- Status/control	Yes; When interface active
- Programming	Yes; When interface active
• Transmission speeds, max.	12 Mbit/s
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address area, max.	32; Virtual slots
• Useful data per address area, max.	32 Byte
• Useful data per address area, of which consistent, max.	32 Byte
2nd interface	
Physics	Ethernet
isolated	Yes
Functionality	
• DP master	No
• DP slave	No
• PROFINET IO controller	Yes
• PROFINET CBA	Yes
• Point-to-point coupling	No
PROFINET CBA	
• Acyclic transmission	Yes
• cyclic transmission	Yes

	6ES7 416-3ER05-0AB0
PROFINET IO controller	
• Services	
- PG/OP communication	Yes
- Routing	Yes; Routing of PG functions
- S7 communication	Yes
- open IE communication	Yes
• Transmission rate, min.	10 Mbit/s
• Transmission speed, max.	100 Mbit/s
• Number of connectable IO devices, max.	256
• Updating time	250 μs to 512 ms; minimum value dependent on preset communication share for PROFINET IO, of number of IO devices and number of configured user data
• Address area	
- Inputs, max.	8 KByte
- Outputs, max.	8 KByte
• Useful data consistency, max.	255 Byte; Including user data attendant
3rd interface	
Type of interfaces	Pluggable interface module (IF), technical specifications as for 2nd interface
pluggable interface module	IF 964-DP (MLFB: 6ES7964-2AA04-0AB0)
Physics	RS 485/Profibus
isolated	Yes
power supply to interface (15 to 30 V DC), max.	150 mA
Number of connection resources	32
Functionality	
• MPI	No
• DP slave	Yes
• DP master	Yes
DP master	
• Number of connections, max.	32
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	Yes
- S7 communication	Yes
- Equidistance support	Yes
- SYNC/FREEZE	Yes
- Activation/deactivation of DP slaves	Yes
- Direct data exchange	Yes
• Transmission rate, max.	12 Mbit/s
• Number of DP slaves, max.	125
• Address area	
- Inputs, max.	8 KByte
- Outputs, max.	8 KByte

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-400

CPU 416-3 PN/DP

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■ Technical specifications (continued)

	6ES7 416-3ER05-0AB0
• Useful data per DP slave	
- Useful data per DP slave, max.	244 Byte
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
- Slots, max.	244
- per slot, max.	128 Byte
DP slave	
• Number of connections	32
• Services	
- Routing	Yes; When interface active
- Programming	Yes; When interface active
- Status/control	Yes; When interface active
• GSD file	http://support.automation.siemens.com/WW/view/de/113652
• Transmission rate, max.	12 Mbit/s
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address range, max.	32
• Useful data per address area, max.	32 Byte
• Useful data per address area, of which consistent, max.	32 Byte
Isochronous mode	
Useful data per isochronoous slave, max.	244 Byte
equidistance	Yes
shortest clock pulse	1 ms; Without use of SFC 126 and 127 up to 0.5 ms
CiR configuration in RUN	
CiR synchronization time, basic load	100 ms
CiR synchronization time, time per I/O slave	40 µs
CPU/programming	
Configuration software	
• STEP 7	Yes
Programming language	
• STEP 7	Yes
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
• CFC	Yes
• GRAPH	Yes
• HiGraph®	Yes
Nesting levels	7
User program protection/password protection	Yes
Dimensions	
Width	50 mm
Height	290 mm
Depth	219 mm
Dimensions	
Required slots	2
Weights	
Weight, approx.	900 g

■ Ordering data

	Order No.
CPU 416-3 PN/DP Main memory 11.2 MB, power supply 24 V DC, MPI/PROFIBUS DP master interface, PROFINET interface, module slot for 1 IF submodule, slot for memory card, incl. slot number labels	**6ES7 416-3ER05-0AB0**
Memory Card RAM	
• 64 KB	**6ES7 952-0AF00-0AA0**
• 256 KB	**6ES7 952-1AH00-0AA0**
• 1 MB	**6ES7 952-1AK00-0AA0**
• 2 MB	**6ES7 952-1AL00-0AA0**
• 4 MB	**6ES7 952-1AM00-0AA0**
• 8 MB	**6ES7 952-1AP00-0AA0**
• 16 MB	**6ES7 952-1AS00-0AA0**
• 64 MB	**6ES7 952-1AY00-0AA0**
FEPROM memory card	
• 64 KB	**6ES7 952-0KF00-0AA0**
• 256 KB	**6ES7 952-0KH00-0AA0**
• 1 MB	**6ES7 952-1KK00-0AA0**
• 2 MB	**6ES7 952-1KL00-0AA0**
• 4 MB	**6ES7 952-1KM00-0AA0**
• 8 MB	**6ES7 952-1KP00-0AA0**
• 16 MB	**6ES7 952-1KS00-0AA0**
• 32 MB	**6ES7 952-1KT00-0AA0**
• 64 MB	**6ES7 952-1KY00-0AA0**
MPI cable For connecting SIMATIC S7 and the PG through MPI; 5 m in length	**6ES7 901-0BF00-0AA0**
IF 964-DP interface module To connect an additional DP line; for CPU 414-3, CPU 414-3 PN/DP, CPU 416-3, CPU 416-3 PN/DP, CPU 417-4	**6ES7 964-2AA04-0AB0**
Slot number plates 1 set (spare part)	**6ES7 912-0AA00-0AA0**
Manual "SIMATIC S7-400 programmable controller" incl. instruction list	
• German	**6ES7 498-8AA05-8AA0**
• English	**6ES7 498-8AA05-8BA0**
• French	**6ES7 498-8AA05-8CA0**
• Spanish	**6ES7 498-8AA05-8DA0**
• Italian	**6ES7 498-8AA05-8EA0**
S7-400 operation list	
• German	**6ES7 498-8AA05-8AN0**
• English	**6ES7 498-8AA05-8BN0**
• French	**6ES7 498-8AA05-8CN0**
• Spanish	**6ES7 498-8AA05-8DN0**
• Italian	**6ES7 498-8AA05-8EN0**

Ordering data	Order No.
Manual "Communication for SIMATIC S7-300/-400"	
• German	**6ES7 398-8EA00-8AA0**
• English	**6ES7 398-8EA00-8BA0**
• French	**6ES7 398-8EA00-8CA0**
• Spanish	**6ES7 398-8EA00-8DA0**
• Italian	**6ES7 398-8EA00-8EA0**
SIMATIC Manual Collection	**6ES7 998-8XC01-8YE0**
Electronic manuals on DVD, five languages: S7-200/300/400, C7, LOGO!, SIMATIC DP, PC, PG, STEP 7, engineering software, runtime software, PCS 7, SIMATIC HMI, SIMATIC NET	
SIMATIC Manual Collection update service for 1 year	**6ES7 998-8XC01-8YE2**
Current "Manual Collection" DVD and the three subsequent updates	
Brochure "SIMATIC S7-400 programmable controller - Design and application"	
• German	**6ES7 498-8AA00-8AB0**
• English	**6ES7 498-8AA00-8BB0**
PROFIBUS bus components	
RS 485 bus connector with 90° cable outlet	
Max. transmission rate 12 Mbit/s	
• Without PG interface	**6ES7 972-0BA12-0XA0**
• With PG interface	**6ES7 972-0BB12-0XA0**
RS 485 bus connector with angled cable outlet	
Max. transmission rate 12 Mbit/s	
• Without PG interface	**6ES7 972-0BA41-0XA0**
• With PG interface	**6ES7 972-0BB41-0XA0**
RS 485 bus connector with 90° cable outlet for FastConnect system	
Max. transmission rate 12 Mbit/s	
• Without PG interface	**6ES7 972-0BA50-0XA0**
• With PG interface	**6ES7 972-0BB50-0XA0**
RS 485 bus connector with axial cable outlet	
For SIMATIC OP, for connection to PPI, MPI, PROFIBUS	**6GK1 500-0EA02**
PROFIBUS FastConnect bus cable	
Standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m	**6XV1 830-0EH10**
RS 485 repeater for PROFIBUS	**6ES7 972-0AA01-0XA0**
Data transfer rate up to 12 Mbit/s; 24 V DC; IP 20 housing	

	Order No.
PROFINET bus components	
IE FC TP Standard Cable GP 2x2	**6XV1 840-2AH10**
4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/ IE FC RJ45 Plug; PROFINET-compatible; with UL approval; Sold by the meter	
FO Standard Cable GP (50/125)	**6XV1 873-2A**
Standard cable, splittable, UL approval, sold by the meter	
SCALANCE X204-2 Industrial Ethernet switch	**6GK5 204-2BB00-2AA3**
Industrial Ethernet switches with integral SNMP access, Web diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; four 10/100 Mbit/s RJ45 ports and two FO ports	
IE FC RJ45 Plugs	
RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables	
IE FC RJ45 Plug 180	
180° cable outlet	
• 1 unit	**6GK1 901-1BB10-2AA0**
• 10 units	**6GK1 901-1BB10-2AB0**
• 50 units	**6GK1 901-1BB10-2AE0**
PROFIBUS/PROFINET bus components	See Catalogs IK PI, CA 01
For establishing MPI/ PROFIBUS/ PROFINET communication	

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-400

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SIPLUS CPU 416-3 PN/DP

■ Overview

- High-performance CPUs in the high-end performance range
- Applicable for plants with high requirements in the high-end performance range
- Integrated PROFINET functions in CPU 416-3 PN/DP

	SIPLUS CPU 416-3 PN/DP
Order No.	**6AG1 416-3ER05-4AB0**
Order No. based on	**6ES7 416-3ER05-4AB0**
Ambient conditions	Suitable for extraordinary medial load (e.g. by chloric and sulphuric atmospheres).
Technical specifications	The technical specifications are identical with those of the based on modules.

■ Ordering data

Ordering data	Order No.
CPU 416-3 PN/DP Main memory 11.2 MByte, power supply 24 V DC, MPI/PROFIBUS DP master interface, PROFINET interface, module slot for 1 IF submodule, slot for memory card, incl. slot number labels	**6AG1 416-3ER05-4AB0**
Accessories	see ordering data to CPU 416-3 PN/DP

■ More information

For technical documentation to SIPLUS see:
http://www.siemens.de/siplus-techdoku

■ Overview

- For constructing a fail-safe automation system for plants with increased safety requirements
- High-performance CPU in the top-end performance range
- Satisfies safety requirements up to SIL 3 acc. to IEC 61508 and Cat. 4 acc. to EN 954-1
- Standard and safety-related tasks can be performed with a single CPU
- Multi-processor mode is possible
- Safety-related communication with distributed I/O devices over PROFIBUS DP with the *PROFI*safe profile
- Fail-safe I/O modules can be connected decentralized over the integrated interfaces (DP and PN with CPU416F-3 PN/DP) and/or through communication modules (CP443-5 Ext. and CP443-1 Adv.)
- Standard modules for non-safety-related applications can be operated centrally and decentralized

■ Technical specifications

	6ES7 416-3FR05-0AB0
Product status	
Firmware version	V 5.0
associated programming package	From STEP7 V 5.4 SP1 or higher
Voltages and currents	
Feeding of external buffer voltage to CPU	5 to 15 V DC
Current consumption	
from backplane bus DC 5 V, max.	1.4 A
from interface DC 5 V, max.	90 mA; At each DP interface
Power loss, typ.	5.5 W
Backup battery	
• Buffer current, typ.	125 µA; Valid up to 40 C
• Buffer current, max.	550 µA
Memory	
Type of storage	
• RAM	
- integrated (for program)	5.6 MByte
- integrated (for data)	5.6 MByte
- expandable	No
• Load memory	
- expandable FEPROM	Yes; With Memory Card (FLASH)
- expandable FEPROM, max.	64 MByte
- integrated RAM, max.	1 MByte
- expandable RAM	Yes; With Memory Card (RAM)
- expandable RAM, max.	64 MByte
Backup	
• present	Yes
• with battery	Yes
• without battery	No
CPU/blocks	
DB	
• Number, max.	10,000; Number range: 1 to 16,000
• Size, max.	64 KByte
FB	
• Number, max.	5,000; Number range: 0 to 7,999
• Size, max.	64 KByte
FC	
• Number, max.	5,000; Number range: 0 to 7,999
• Size, max.	64 KByte
OB	
• Number, max.	See Instruction List
• Size, max.	64 KByte
• Number of isochronous mode Obs	4
Nesting depth	
• per priority class	24
• additional within an error OB	2
CPU/processing times	
for bit operations, min.	30 ns
for word operations, min.	30 ns
for fixed point arithmetic, min.	30 ns
for floating point arithmetic, min.	90 ns

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-400

CPU 416F-3 PN/DP

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■ **Technical specifications** (continued)

	6ES7 416-3FR05-0AB0
Times/counters and their remanence	
S7 counter	
• Number	2,048
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	2,047
- preset	From Z 0 to Z 7
• Counting range	
- lower limit	0
- upper limit	999
IEC counter	
• present	Yes
• Type	SFB
S7 times	
• Number	2,048
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	2,047
- preset	No timers retentive
• Time range	
- lower limit	10 ms
- upper limit	9,990 s
IEC timer	
• present	Yes
• Type	SFB
Data areas and their remanence	
remanent data area, total	Total working and load memory (with backup battery)
Flag	
• Number, max.	16 KByte; Size of bit memory addess area
• Remanence available	Yes
• Number of clock memories	8; (in 1 memory byte)
Address area	
I/O address area	
• Inputs	16 KByte
• Outputs	16 KByte
• of which, distributed	
- MPI/DPinterface, inputs	2 KByte
- MPI/DP interface, outputs	2 KByte
- DP interface, inputs	8 KByte
- DP interface, outputs	8 KByte
- PN interface, inputs	8 KByte
- PN interface, outputs	8 KByte
Process image	
• Inputs, adjustable	16 KByte
• Outputs, adjustable	16 KByte
• Inputs, preset	512 Byte
• Outputs, preset	512 Byte
• consistent data, max.	244 Byte
• Access to consistent data in process image	Yes
Subprocess images	
• Number of subprocess images, max.	15

	6ES7 416-3FR05-0AB0
Digital channels	
• Inputs	131,072
• Outputs	131,072
• Inputs, of which central	131,072
• Outputs, of which central	131,072
Analog channels	
• Inputs	8,192
• Outputs	8,192
• Inputs, of which central	8,192
• Outputs, of which central	8,192
Hardware config.	
connectable OPs	63
Central devices, max.	1
Expansion devices, max.	21
Multicomputing	Yes; 4 CPUs max. (with UR1 or UR2)
IM	
• Number of connectable IMs (total), max.	6
• Number of connectable IM 460s, max.	6
• Number of connectable IM 463s, max.	4; IM 463-2
Number of DP masters	
• integrated	1
• via IM 467	4
• via CP	10; CP 443-5 Ext.
• Mixed mode IM + CP permitted	No; IM 467 not suitable for use with CP 443-5 Ext. and CP 443-1 EX4x (in PN IO mode)
• via interface module	1; IF 964-DP
• Number of pluggable S5 modules (via adapter capsule in central device), max.	6
Number of IO controllers	
• integrated	1
• via CP	4; Via CP 443-1 EX41 in PN operation: 4 max. in central unit
Number of operable FMs and CPs (recommended)	
• FM	Limited due to number of slots and number of connections
• CP, point-to-point	Limited due to number of slots and number of connections
• PROFIBUS and Ethernet CPs	14; Of which 10 CP/IM max. as DP master and PN controller
Time	
Clock	
• Hardware clock (real-time clock)	Yes
• buffered and synchronizable	Yes
• Resolution	1 ms
Operating hours counter	
• Number	8
Clock synchronization	
• supports	Yes
• to MPI, Master	Yes
• to MPI, Slave	Yes
• to DP, Master	Yes
• to DP, Slave	Yes
• in AS, Master	Yes
• in AS, Slave	Yes
• on Ethernet via NTP	Yes; As client
• to IF 964 DP	Yes

■ **Technical specifications** (continued)

	6ES7 416-3FR05-0AB0
S7 message functions	
Number of login stations for message functions, max.	63; Max. 63 with alarm_S and alarm_D (OP's); max. 12 with alarm_8 and alarm_P (e.g. WinCC)
Symbol-related messages	Yes
Number of messages	
• overall, max.	1,024
Block related messages	Yes
Alarm 8-blocks	Yes
Instrumentation & control messages	Yes
Test commissioning functions	
Status/control	
• Status/control variable	Yes
Forcing	
• Forcing	Yes
Status block	Yes
Single step	Yes
Number of breakpoints	4
Diagnostic buffer	
• present	Yes
• Number of entries, max.	3,200
• adjustable	Yes
• preset	120
Communication functions	
PG/OP communication	Yes
Routing	Yes
Global data communication	
• supported	Yes
• Size of GD packets, max.	54 Byte
S7 basic communication	
• supported	Yes
• Useful data per job, max.	76 Byte
S7 communication	
• supported	Yes
• Useful data per job, max.	64 KByte
S5-compatible communication	
• supported	Yes; (via CP -max. 10- and FC AG_SEND and FC AG_RECV)
• Useful data per job, max.	8 KByte
Standard communication (FMS)	
• supported	Yes; Via CP and loadable FB
Web server	Yes; Read-only function
Open IE communication	
• TCP/IP	Yes
- Number of connections, max.	64
- Data length, max.	32 KByte
• ISO-on-TCP (RFC1006)	Yes
- Number of connections, max.	64
- Data length, max.	32 KByte; 1452 bytes via CP 443-1 Adv.
• UDP	Yes
- Number of connections, max.	64
- Data length, max.	1,472 Byte
Number of connections	
• overall	64

	6ES7 416-3FR05-0AB0
PROFINET CBA (at set setpoint communication load)	
• Number of remote interconnection partners	32
• Number of functions, master/slave	150
• Total of all master/slave connections	6,000
• Data length of all incoming connections master/slave, max.	65,000 Byte
• Data length of all outgoing connections master/slave, max.	65,000 Byte
• Number of device-internal and PROFIBUS interconnections	1,000
• Data length of device-internal and PROFIBUS interconnections, max.	16,000 Byte
• Data length per connection, max.	2,000 Byte
• Remote interconnections with acyclic transmission	
- Sampling frequency: sampling interval, min.	200 ms; Depending on preset communcation load, number of interconnections and data length used
- Number of incoming interconnections	500
- Number of outgoing interconnections	500
- Data length of all incoming interconnections, max.	16,000 Byte
- Data length of all outgoing interconnections, max.	16,000 Byte
- Data length per connection, max.	2,000 Byte
• Remote interconnections with cyclic transmission	
- Transmission frequency: transmission interval, min.	1 ms; Depending on preset communication load, number of interconnections and data length used
- Number of incoming interconnections	300
- Number of outgoing interconnections	300
- Data length of all incoming interconnections, max.	4,800 Byte
- Data length of all outgoing interconnections, max.	4,800 Byte
- Data length per connection, max.	250 Byte
• HMI variables via PROFINET (acyclic)	
- Number of log-in stations for HMI variables (PN OPC/iMap)	2x PN OPC/1x iMap
- HMI variable updating	500 ms
- Number of HMI variables	1,500
- Data length of all HMI variables, max.	48,000 Byte
• PROFIBUS proxy functionality	
- supported	Yes; 32 PROFIBUS slaves max. connectable
- Data length per connection, max.	240 Byte; Slave-dependent
1st interface	
Physics	RS 485 / PROFIBUS + MPI
isolated	Yes
Functionality	
• MPI	Yes
• DP master	Yes
• DP slave	Yes

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-400

CPU 416F-3 PN/DP

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■ **Technical specifications** (continued)

	6ES7 416-3FR05-0AB0
MPI	
• Number of connections	44
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	Yes
- S7 basic communication	Yes
- S7 communication	Yes
• Transmission speeds, max.	12 Mbit/s
DP master	
• Number of connections, max.	32; If a diagnostic repeater is used on the line, the number of connection resources on the line is reduced by 1
• Services	
- PG/OP communication	Yes
- Routing	Yes
- S7 basic communication	Yes
- S7 communication	Yes
- equidistance support	Yes
- Activation/deactivation of DP slaves	Yes
- direct data exchange (cross traffic)	Yes
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	32
• Address area	
- Inputs, max.	2 KByte
- Outputs, max.	2 KByte
• Useful data per DP slave	
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
DP slave	
• Number of connections	32
• Services	
- Routing	Yes; When interface active
- Status/control	Yes; When interface active
- Programming	Yes; When interface active
• Transmission speeds, max.	12 Mbit/s
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address area, max.	32; Virtual slots
• Useful data per address area, max.	32 Byte
• Useful data per address area, of which consistent, max.	32 Byte
2nd interface	
Physics	Ethernet
isolated	Yes
Functionality	
• DP master	No
• DP slave	No
• PROFINET IO controller	Yes
• PROFINET CBA	Yes
• Point-to-point coupling	No

	6ES7 416-3FR05-0AB0
PROFINET CBA	
• Acyclic transmission	Yes
• cyclic transmission	Yes
PROFINET IO controller	
• Services	
- PG/OP communication	Yes
- Routing	Yes; Routing of PG functions
- S7 communication	Yes
- open IE communication	Yes
• Transmission rate, min.	10 Mbit/s
• Transmission speed, max.	100 Mbit/s
• Number of connectable IO devices, max.	256
• Updating time	250 µs to 512 ms; minimum value dependent on preset communication share for PROFINET IO, of number of IO devices and number of configured user data
• Address area	
- Inputs, max.	8 KByte
- Outputs, max.	8 KByte
• Useful data consistency, max.	255 Byte; Including user data attendant
3rd interface	
Type of interfaces	Pluggable interface module (IF), technical specifications as for 2nd interface
pluggable interface module	IF 964-DP (MLFB: 6ES7964-2AA04-0AB0)
Physics	RS 485/PROFIBUS
isolated	Yes
power supply to interface (15 to 30 V DC), max.	150 mA
Number of connection resources	32
Functionality	
• MPI	No
• DP slave	Yes
• DP master	Yes
DP master	
• Number of connections, max.	32
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	Yes
- S7 communication	Yes
- Equidistance support	Yes
- SYNC/FREEZE	Yes
- Activation/deactivation of DP slaves	Yes
- Direct data exchange	Yes
• Transmission rate, max.	12 Mbit/s
• Number of DP slaves, max.	125
• Address area	
- Inputs, max.	8 KByte
- Outputs, max.	8 KByte

■ Technical specifications (continued)

	6ES7 416-3FR05-0AB0
• Useful data per DP slave	
- Useful data per DP slave, max.	244 Byte
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
- Slots, max.	244
- per slot, max.	128 Byte
DP slave	
• Number of connections	32
• Services	
- Routing	Yes; When interface active
- Programming	Yes; When interface active
- Status/control	Yes; When interface active
• GSD file	*http://support.automation. siemens.com/WW/view/ de/113652*
• Transmission rate, max.	12 Mbit/s
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address range, max.	32
• Useful data per address area, max.	32 Byte
• Useful data per address area, of which consistent, max.	32 Byte
Isochronous mode	
Useful data per isochronoous slave, max.	244 Byte
equidistance	Yes
shortest clock pulse	1 ms; Without use of SFC 126 and 127 up to 0.5 ms
CiR configuration in RUN	
CiR synchronization time, basic load	100 ms
CiR synchronization time, time per I/O slave	40 µs
CPU/programming	
Configuration software	
• STEP 7	Yes
Programming language	
• STEP 7	Yes
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
• CFC	Yes
• GRAPH	Yes
• HiGraph®	Yes
Nesting levels	7
User program protection/password protection	Yes
Dimensions	
Width	50 mm
Height	290 mm
Depth	219 mm
Dimensions	
Required slots	2
Weights	
Weight, approx.	900 g

■ Ordering data

	Order No.
CPU 416F-3 PN/DP For configuring safety-related automation systems; main memory 11.2 MB, 24 V DC power supply, MPI/PROFIBUS DP master inter-face, PROFINET interface, PROFIBUS DP master interface, receptacle for 1 IF submodule, slot for memory card, incl. slot number labels	**6ES7 416-3FR05-0AB0**
Option package S7 F Distributed Safety V5.4 for generating fail-safe programs for the S7-300F	
• Floating license	**6ES7 833-1FC02-0YA5**
• Upgrade from V5.x to V5.4	**6ES7 833-1FC02-0YE5**
• Software Update Service	**6ES7 833-1FC00-0YX2**
Memory Card RAM	
• 64 KB	**6ES7 952-0AF00-0AA0**
• 256 KB	**6ES7 952-1AH00-0AA0**
• 1 MB	**6ES7 952-1AK00-0AA0**
• 2 MB	**6ES7 952-1AL00-0AA0**
• 4 MB	**6ES7 952-1AM00-0AA0**
• 8 MB	**6ES7 952-1AP00-0AA0**
• 16 MB	**6ES7 952-1AS00-0AA0**
• 64 MB	**6ES7 952-1AY00-0AA0**
FEPROM memory card	
• 64 KB	**6ES7952-0KF00-0AA0**
• 256 KB	**6ES7952-0KH00-0AA0**
• 1 MB	**6ES7 952-1KK00-0AA0**
• 2 MB	**6ES7 952-1KL00-0AA0**
• 4 MB	**6ES7 952-1KM00-0AA0**
• 8 MB	**6ES7 952-1KP00-0AA0**
• 16 MB	**6ES7 952-1KS00-0AA0**
• 32 MB	**6ES7 952-1KT00-0AA0**
• 64 MB	**6ES7 952-1KY00-0AA0**
MPI cable For connecting SIMATIC S7 and the PG through MPI; 5 m in length	**6ES7 901-0BF00-0AA0**
IF 964-DP interface module For connecting an additional DP line	**6ES7 964-2AA04-0AB0**
Slot number plates 1 set (spare part)	**6ES7 912-0AA00-0AA0**
Manual "SIMATIC S7-400 programmable controller" incl. instruction list	
• German	**6ES7 498-8AA05-8AA0**
• English	**6ES7 498-8AA05-8BA0**
• French	**6ES7 498-8AA05-8CA0**
• Spanish	**6ES7 498-8AA05-8DA0**
• Italian	**6ES7 498-8AA05-8EA0**

PROFINET/Industrial Ethernet
CPUs for SIMATIC S7-400

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CPU 416F-3 PN/DP

Ordering data	Order No.
S7-400 operation list	
• German	**6ES7 498-8AA05-8AN0**
• English	**6ES7 498-8AA05-8BN0**
• French	**6ES7 498-8AA05-8CN0**
• Spanish	**6ES7 498-8AA05-8DN0**
• Italian	**6ES7 498-8AA05-8EN0**
Manual "Communication for SIMATIC S7-300/-400"	
• German	**6ES7 398-8EA00-8AA0**
• English	**6ES7 398-8EA00-8BA0**
• French	**6ES7 398-8EA00-8CA0**
• Spanish	**6ES7 398-8EA00-8DA0**
• Italian	**6ES7 398-8EA00-8EA0**
SIMATIC Manual Collection	**6ES7 998-8XC01-8YE0**
Electronic manuals on DVD, five languages: S7-200/300/400, C7, LOGO!, SIMATIC DP, PC, PG, STEP 7, engineering software, runtime software, PCS 7, SIMATIC HMI, SIMATIC NET	
SIMATIC Manual Collection update service for 1 year	**6ES7 998-8XC01-8YE2**
Current "Manual Collection" DVD and the three subsequent updates	
Brochure "SIMATIC S7-400 programmable controller - Design and application"	
• German	**6ES7 498-8AA00-8AB0**
• English	**6ES7 498-8AA00-8BB0**
PROFIBUS bus components	
RS 485 bus connector with 90° cable outlet	
Max. transmission rate 12 Mbit/s	
• Without PG interface	**6ES7 972-0BA12-0XA0**
• With PG interface	**6ES7 972-0BB12-0XA0**
RS 485 bus connector with angled cable outlet	
Max. transmission rate 12 Mbit/s	
• Without PG interface	**6ES7 972-0BA41-0XA0**
• With PG interface	**6ES7 972-0BB41-0XA0**
RS 485 bus connector with 90° cable outlet for FastConnect system	
Max. transmission rate 12 Mbit/s	
• Without PG interface	**6ES7 972-0BA50-0XA0**
• With PG interface	**6ES7 972-0BB50-0XA0**
RS 485 bus connector with axial cable outlet	
For SIMATIC OP, for connection to PPI, MPI, PROFIBUS	**6GK1 500-0EA02**
PROFIBUS FastConnect bus cable	
Standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m	**6XV1 830-0EH10**
RS 485 repeater for PROFIBUS	**6ES7 972-0AA01-0XA0**
Data transfer rate up to 12 Mbit/s; 24 V DC; IP 20 housing	

	Order No.
PROFINET bus components	
IE FC TP Standard Cable GP 2x2	**6XV1 840-2AH10**
4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/IE FC RJ45 Plug; PROFINET-compatible; with UL approval; Sold by the meter	
FO Standard Cable GP (50/125)	**6XV1 873-2A**
Standard cable, splittable, UL approval, sold by the meter	
SCALANCE X204-2 Industrial Ethernet switch	**6GK5 204-2BB00-2AA3**
Industrial Ethernet switches with integral SNMP access, Web diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; four 10/100 Mbit/s RJ45 ports and two FO ports	
IE FC RJ45 Plugs	
RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables	
IE FC RJ45 Plug 180	
180° cable outlet	
• 1 unit	**6GK1 901-1BB10-2AA0**
• 10 units	**6GK1 901-1BB10-2AB0**
• 50 units	**6GK1 901-1BB10-2AE0**
PROFIBUS/PROFINET bus components	See Catalogs IK PI, CA 01
For establishing MPI/PROFIBUS/PROFINET communication	

Overview

PN	ISO	TCP/IP	UDP	PG	S7	S5	IT	FTP
■		■	■	■	■	■	■	

- Interface for the SIMATIC S7-300 to Industrial Ethernet (not for SINUMERIK)
  - 2 x RJ45 interface for 10/100 Mbit/s full/half duplex connection (with Autosensing for automatic switchover and Autocrossover function)
  - Integral 2-port real-time switch ERTEC *NEW*
  - Multi-protocol operation with TCP and UDP transport protocol and PROFINET IO *NEW*
  - Keep Alive function
- Communication services:
  - Open IE communication (TCP/IP and UDP)
  - PG/OP communication
  - S7 communication (server)
  - S5-compatible communication
  - PROFINET IO device *NEW*
- Multicast for UDP
- Remote programming and initial start-up is possible exclusively over Industrial Ethernet
- Integration into network management through SNMP
- Configuration with NCM S7 for Industrial Ethernet (integrated into STEP 7)
- Cross-network programming device/operator panel communication through S7 routing
- Diagnostic possibilities in STEP 7 and with web browser *NEW*

Benefits

- Direct integration of S7-300 in complex systems by means of Industrial Ethernet at 100 Mbit/s
- Ideally suited for use in networks with line topology through integral 2-port real-time switch
- Investment protection for existing plants through the integration of the SIMATIC S7-300 by means of the S5-compatible communication
- Simple, fast data exchange between SIMATIC S7-300 and other programmable controllers through link as PROFINET IO device
  - openness through use on any PROFINET IO controllers
  - configuring using a GSDML file
- Flexible use thanks to lack of slot rules
- One slot is saved thanks to single-width format
- Remote programming is possible due to the WAN characteristic of TCP/IP, even via the telephone network (e.g. ISDN)
- A large number of stations can be accessed thanks to the multicast function
- Access by as many as 4 HMI systems to the SIMATIC S7-300
- Use of the socket interface in the partner system possible without RFC 1006
- Initial start-up can be performed directly over Industrial Ethernet
- Uncrossed connecting cables can be used due to the integrated Autocrossover function
- Secure data communication by means of industry-standard device interface using the plug-in connector IE FC RJ45 Plug 145/180 and additional strain relief by latching the connector to the housing

Application

The CP 343-1 Lean is the communications processor for connecting SIMATIC S7-300 to Industrial Ethernet.

With its own processor, the CP 343-1 Lean relieves the CPU of communications tasks and facilitates additional connections.

The CP 343-1 Lean permits communication of the S7-300 with:
- Programming devices, processors and HMI devices
- Other SIMATIC S7 systems
- SIMATIC S5 PLCs
- PROFINET IO controllers

PROFINET/Industrial Ethernet
System interfacing for SIMATIC and SINUMERIK

2

CP 343-1 Lean

Design

The CP 343-1 Lean offers all the advantages of SIMATIC S7-300 system design:

- Compact design;
  the rugged plastic casing features on the front:
  - two RJ45 sockets for connecting to Industrial Ethernet with automatic detection of data transfer rate by means of Autosensing;
    RJ45 sockets have an industry-compatible design with additional securing collar for connection of IE FC RJ45 Plug 145/180
  - diagnostic LEDs for each switch port
  - 2-pin plug-in terminal block for connecting the external supply voltage of 24 V DC
- Easy installation;
  The CP 343-1 Lean is snap-mounted on the S7-300 DIN rail and connected to adjacent modules through the bus connectors. There are no slot rules.
- The CP 343-1 Lean can be operated without a fan. A standby battery is not required.
- In combination with IM 360/361, CP 343-1 Lean can also be used in an expansion rack (ER).
- The module can be replaced without the need for a programming device

Function

The CP 343-1 Lean independently handles data traffic over Industrial Ethernet. The module has its own processor. Layers 1 to 4 comply with international standards.

Multi-protocol operation of the transport protocols TCP/IP and UDP as well as PROFINET IO is possible.

The CP 343-1 Lean has a preset unique Ethernet address and can be put directly into operation through the network.

The CP 343-1 Lean works in multi-protocol mode for the following communication services:

PG/OP communication

PG/OP communication allows all S7 stations connected to the network to be remotely programmed.

- S7 routing;
  With the aid of S7 routing it is possible to use programming device communication across networks.

S7 communication

For connecting the S7-300 (server only) to S7-400, HMI units and PCs (SOFTNET-S7 or CP 1613 A2 with S7-1613).

Open IE and S5-compatible communication

On the basis of layer 4, the S5-compatible communication with SEND/RECEIVE offers a simple and optimized interface for data communication. Up to 8 KB of data can be transmitted in one call.

This interface enables

- TCP transport connections
- UDP
  - Multicast for UDP

to be used.

Open IE and S5-compatible communication is used for communication with SIMATIC S5, SIMATIC S7-400/300 and computers/PCs.

The function blocks required are a component part of NCM S7 for Industrial Ethernet and must be integrated into the S7 user program.

S5-compatible communication with FETCH/WRITE allows direct access to the CPU data of the SIMATIC S7 (in the same way as in the CP 1430 TCP and the SIMATIC S5). This means existing HMI systems can still be used.

Implementing UDP as the transmission protocol allows utilization of the multicast function to simultaneously send and receive data on configured multicast circuits.

PROFINET IO device functionality

The CP 343-1 Lean can be operated as a PROFINET IO device in order to exchange data from the user program of the S7-300 station with a PROFINET IO controller just like a field device (as input and output data). This high-performance data exchange using PROFINET IO communication mechanisms is handled by the CP 343-1 Lean on its own.

Diagnostics

Comprehensive diagnostic options are available via STEP 7 or a web browser, including:

- Status of the CP
- General diagnostics and statistics functions
- Connection diagnostics
- LAN controller statistics
- Diagnostic buffer
- Web diagnostics with basic diagnostic information

Via SNMP all MIB-2 objects can be read out. This enables the current status of the Ethernet interfaces to be retrieved.

Configuration

For configuration of the CP 343-1 Lean (6GK7343-1CX10-0XE0) including the PROFINET IO functions, you require STEP 7 V5.4 or higher and NCM S7 for Industrial Ethernet plus the Hardware Support Package (HSP). For configuration of the CP 343-1 Lean (6GK7343-1CX10-0XE0) without PROFINET IO functionality (analogous to predecessor version 6GK7343-1CX00-0XE0), you require at least STEP 7 V5.2 SP3. NCM S7 is completely embedded in the STEP 7 environment.

The configuration data of the CP is stored on the CPU. This allows the module to be replaced without a programming device.

PROFINET/Industrial Ethernet
## System interfacing for SIMATIC and SINUMERIK

CP 343-1 Lean

2

■ Integration
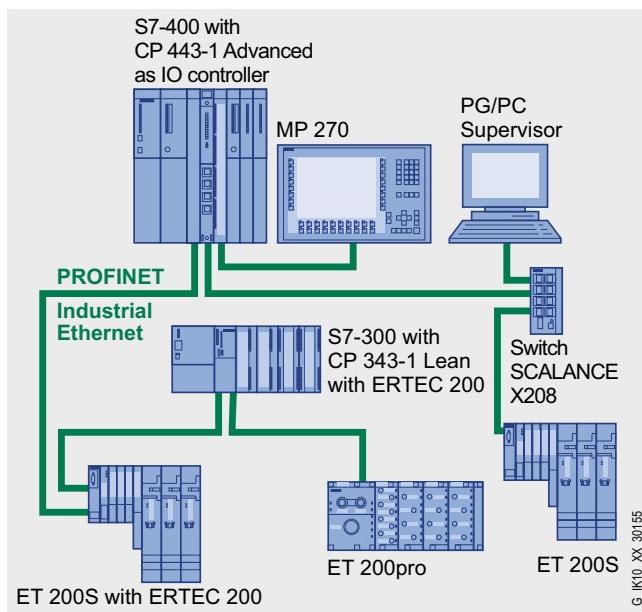
Line structure with CP 343-1 Lean with integrated real-time switch as a PROFINET IO device
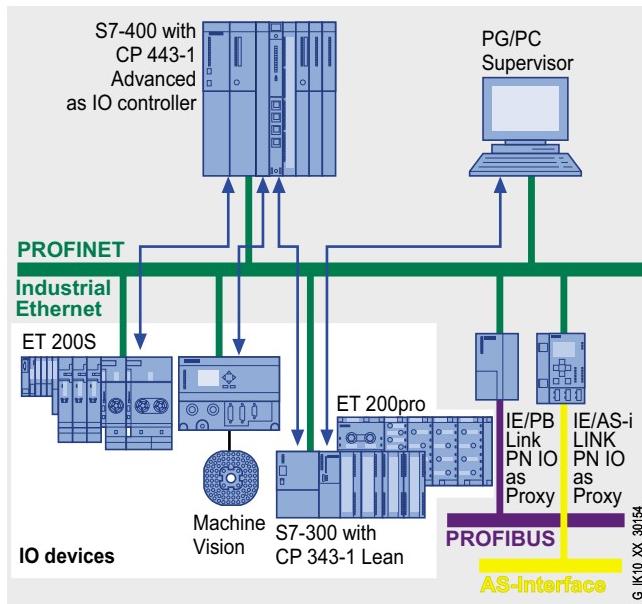
Example configuration of CP 343-1 Lean as PROFINET IO device

■ Technical specifications

Technical specifications	
Transfer rate	10/100 Mbit/s Autosensing
Interfaces	
• Communication connection, electrical	2 x RJ45 socket (10/100 Mbit/s; TP) Autonegotiation/Autocrossover function
• Connection for supply voltage	1 x 2-pin plug-in terminal block
Supply voltage	+24 V DC (permissible range: +20.4 V ... +28.8 V)
Current consumption	
• from the backplane bus	max. 200 mA
• From 24 V DC external	typ. 160 mA max. 200 mA
Power loss	5.8 W
Permissible ambient conditions	
• Operating temperature	0 °C to +60 °C
• Transport/storage temperature	-40 °C to +70 °C
• Relative humidity	Max. 95% at +25 °C
Design	
• Module format	Compact module S7-300, single width
• Dimensions (W x H x D) in mm	40 x 125 x 120
• Weight	Approx. 200 g
Configuring software	NCM S7 for Industrial Ethernet (included in the scope of delivery of STEP 7 V5.x).

Performance data	
Open IE/S5-compatible communication (SEND/RECEIVE)	
• Sum of all simultaneously operable TCP/UDP connections	max. 8
• Useful data	
- TCP	8 KB
- UDP	2 KB
S7 communication	
• Number of connections	max. 4
PG/OP communication	
• Number of operable OP connections (acyclic services)	max. 4
Multi-protocol operation	
• Sum of all simultaneously operable connections	max. 12
Multicast	8
PROFINET communication 🆕	
PROFINET IO device	
• Size of IO data areas	
- IO input area	512 byte
- IO output area	512 byte
• Size of IO data area per submodule	
- Inputs	max. 240 byte
- Outputs	max. 240 byte
• Number of submodules	max. 32

PROFINET/Industrial Ethernet
System interfacing for SIMATIC and SINUMERIK

CP 343-1 Lean

■ **Ordering data**

	Order No.		Order No.
CP 343-1 Lean communications processor For connecting SIMATIC S7-300 to Industrial Ethernet through TCP/IP and UDP, Multicast, S7 communication, S5-compatible communication (SEND/RECEIVE), FETCH/WRITE, PROFINET IO device, integral 2-port switch ERTEC, comprehensive diagnostics facilities, module replacement without PG, SNMP, initial start-up over LAN; with electronic manual on CD-ROM	6GK7 343-1CX10-0XE0	**SOFTNET-S7 Lean Edition 2006 for Industrial Ethernet** Software for S7 and S5-compatible communication, incl. OPC server, PG/OP communication and NCM PC; up to 8 connections, runtime software, software and electronic manual on CD-ROM, license key on diskette, Class A, for 32-bit Windows XP Professional, 2003 Server, 2000 Professional/Server; German/English	
		• Single license for 1 installation	**6GK1 704-1LW64-3AA0**
IE FC TP Standard Cable GP 2x2 4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/ IE FC RJ45 Plug; PROFINET-compatible; with UL approval; sold by the meter	6XV1 840-2AH10	• Software Update Service for 1 year, with automatic extension; requirement: Current software version	**6GK1 704-1LW00-3AL0**
		• Upgrade from V6.0 and higher to Edition 2006	**6GK1 704-1LW64-3AE0**
FO Standard Cable GP (50/125) Standard cable, splittable, UL approval, sold by the meter	6XV1 873-2A	**S7-1613 Edition 2006** Software for S7 and S5 communication, incl. PG/OP communication, OPC server and NCM PC; up to 120 connections, single license for 1 installation, runtime software, software and electronic manual on CD-ROM, license key on diskette, Class A, for 32-bit Windows XP Professional, 2003 Server, Windows 2000 Professional/Server; for CP 1613/CP 1613 A2 German/English	6GK1 716-1CB64-3AA0
SCALANCE X204-2 Industrial Ethernet switch Industrial Ethernet switches with integral SNMP access, online diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; four 10/100 Mbit/s RJ45 ports and two FO ports	6GK5 204-2BB00-2AA3		
IE FC RJ45 Plug 145 RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 145° cable outlet;		**NCM S7 configuration software for Industrial Ethernet** NCM S7 configuration software version V5.4 for Industrial Ethernet CPs, for execution under STEP 7 V5.4; additional Hardware Support Package (HSP); [1] Documentation on CD-ROM, with electronic manual in English, German, French, Spanish and Italian	Included in the STEP 7 V5 package
• 1 pack = 1 unit	**6GK1 901-1BB30-0AA0**		
• 1 pack = 10 units	**6GK1 901-1BB30-0AB0**	**Documentation S7-CPs/NCM S7** For Industrial Ethernet and PROFIBUS; manual package for configuring S7-CPs, IE/PB Link and PC stations (STEP 7 V5.3 and higher)	
• 1 pack = 50 units	**6GK1 901-1BB30-0AE0**		
SOFTNET-S7 Edition 2006 for Industrial Ethernet Software for S7 and S5-compatible communication, incl. OPC server, PG/OP communication and NCM PC; up to 64 connections, runtime software, software and electronic manual on CD-ROM, license key on diskette, Class A, for 32-bit Windows XP Professional, 2003 Server, 2000 Professional/Server; German/English		• German	**6GK7 080-0AA01-8AA0**
		• English	**6GK7 080-0AA01-8BA0**
• Single license for 1 installation	**6GK1 704-1CW64-3AA0**		
• Software Update Service for 1 year, with automatic extension; requirement: Current software version	**6GK1 704-1CW00-3AL0**		
• Upgrade from V6.0 and higher to Edition 2006	**6GK1 704-1CW64-3AE0**		

1) The HSP for the CP 343-1 Lean (6GK7 343-1CX10-0XE0) can be directly downloaded and installed from the Internet using STEP 7, and is already included in STEP 7 V5.4 SP1 and higher.

■ **More information**

The NCM S7 configuration software for Industrial Ethernet is included in the scope of supply of STEP 7 V5.2.

Overview

PN	ISO	TCP/IP	UDP	PG	S7	S5	IT	FTP
■	■	■	■	■	■	■	■	

- Connection of SIMATIC S7-300/SINUMERIK 840D powerline to Industrial Ethernet
  - 2 x RJ45 interface for 10/100 Mbit/s full/half duplex connection with Autosensing/Autonegotiation and Autocrossover function
  - Integral 2-port real-time switch ERTEC (NEW)
  - Multi-protocol operation with ISO, TCP and UDP transport protocol and PROFINET IO
  - Adjustable Keep Alive function
- Communication services:
  - Open IE communication (ISO, TCP/IP and UDP)
  - PROFINET IO controller or PROFINET IO device (NEW)
  - PG/OP communication:
    Cross-network by means of S7 routing
  - S7 communication (client, server, multiplexing)
  - S5-compatible communication
- Multicast for UDP
- IP address assignment via DHCP, simple PC tool or via the user program (e.g. HMI)
- Access protection by means of configurable access list
- Remote programming and initial startup via Industrial Ethernet
- Automatic setting of the CPU clock via Ethernet with NTP or SIMATIC procedure
- Integration in network management systems over SNMP (MIB2 diagnostic information)
- Diagnostic possibilities in STEP 7 and with web browser (NEW)

Benefits

g·e·get Designed for Industry

- Ideally suited for use in networks with a line topology through an integral 2-port real-time switch
- Connection of field devices to Industrial Ethernet with PROFINET
- Quick and easy exchange of data between SIMATIC S7-300 and other programmable controllers by connecting as a PROFINET IO device
- Investment protection for existing plants through the integration of the SIMATIC S7-300 by means of the S5-compatible communication
- Security:
  Protection through device-oriented IP address lists without the need for changing passwords
- Remote programming is possible due to the WAN characteristic of TCP/IP, even via the telephone network (e.g. ISDN)
- Setting of intrinsic IP parameters of series machines without STEP 7
- Plant-wide time synchronization via NTP or SIMATIC procedure
- Accessibility of many nodes by means of free UDP connections or multicast function
- Use of the socket interface in the partner system possible without RFC 1006
- One slot is saved due to the single-width format
- Uncrossed connecting cables can be used due to the integrated Autocrossover function

Application

The CP 343-1 is the communications module for the SIMATIC S7-300 for connection to Industrial Ethernet.

With its integral processor, it takes communications load off the CPU and permits additional connections.

The CP 343-1 permits communication of the S7-300 with:

- Programming devices, computers, HMI devices
- Other SIMATIC S7/C7 systems
- SIMATIC S5 programmable controllers
- SINUMERIK 840D powerline
- Field devices (PROFINET IO devices)
- Non-Siemens devices

The CP 343-1 can be used in the SINUMERIK 840D powerline to connect it to Industrial Ethernet and to communicate with other automation systems, e.g. by means of open IE communication, S7 communication, or PROFINET communication.

PROFINET/Industrial Ethernet
System interfacing for SIMATIC and SINUMERIK

2

CP 343-1

■ Design

The CP 343-1 offers all the advantages of SIMATIC S7-300 system design:

- Compact design;
  on the front, the rugged plastic housing features:
  - Two RJ45 sockets for connection to Industrial Ethernet with automatic sensing of the data transmission rate by means of Autosensing/Autonegotiation;
    the RJ45 sockets are industrially compatible and designed with additional holding collars for connecting to the IE FC RJ45 Plug 145/180
  - 2-pole plug-in terminal strip for connection of the 24 V DC external supply voltage
  - 8 LEDs for indication of the operating and communication status (diagnostics for each switch port)
- Easy installation;
  the CP 343-1 is mounted on the S7-300 rail and connected through the bus connector with the neighboring modules. There are no slot rules.
- Fan-free operation;
  A back-up battery is not required.
- Using the IM 360/361, the CP 343-1 can also be operated in the expansion rack (ER)
- Modules can be replaced without the need for a programming device

■ Function

The CP 343-1 independently handles data traffic over Industrial Ethernet. The module has its own processor. Layers 1 to 4 comply with international standards.

Multi-protocol operation of the transport protocols ISO, TCP/IP, UDP and PROFINET IO is possible. For connection control (keep alive) it is possible to configure an adjustable time for all TCP transport connections for active and passive partners.

The CPU's time can be set using NTP or SIMATIC procedures with an accuracy of approx. +/-1 s.

The CP 343-1 has a preset unique Ethernet address and can be put directly into operation over the network.

The CP 343-1 works in multi-protocol mode for the following communication services:

PG/OP communication

PG/OP communication allows all S7 stations connected to the network to be remotely programmed.

- S7 routing;
  with the aid of S7 routing it is possible to use programming device communication across networks

PROFINET communication

- *PROFINET IO controller*;
  for connecting field devices over Industrial Ethernet, the CP 343-1 supports the functions of a PROFINET IO controller
- *PROFINET IO device;*
  the CP 343-1 can be operated as a PROFINET IO device for exchanging data from the user program of the S7-300 station like a field device (as input and output data) with a PROFINET IO controller.

Access by means of I/O data from the user program of the S7-300 station is through the PNIO_SEND and PNIO_RECV blocks.

S7 communication

For connecting the S7-300 (server and client) to S7-200/300/400 (server and client), HMI units and PCs (SOFTNET-S7 or CP 1613 A2 with S7-1613).

Open IE and S5-compatible communication

Based on layer 4, this is a simple, optimized interface for data communication. Up to 8 KB of data can be transmitted in one call.

The following connection possibilities can be used with this interface:

- TCP transport connections
  - TCP with RFC 1006
  - TCP without RFC 1006
- UDP
  - Multicast for UDP
- ISO transport connections

Open IE and S5-compatible communication is used for communication with SIMATIC S5, SIMATIC S7-400/300 and computers/PCs.

The function blocks required are a component part of STEP 7 for Industrial Ethernet and must be integrated into the S7 user program.

S5-compatible communication with FETCH/WRITE allows direct access to the CPU data of the SIMATIC S7 (in the same way as in the CP 1430 TCP and the SIMATIC S5). This means existing HMI systems can still be used.

Implementing UDP as the transmission protocol allows utilization of the multicast function to simultaneously send and receive data on configured multicast circuits.

Diagnostics

Comprehensive diagnostic options are available via STEP 7 or a web browser, including:

- Operating status of CP
- Operating status of PROFINET devices connected to CP
- General diagnostics and statistics functions
- Connection diagnostics
- LAN controller statistics
- Diagnostic buffer
- Web diagnostics with basic diagnostic functions

Diagnostics possibilities during operation.

- Status scanning of connections using function block
- SNMP MIB-2 objects;
  the current status of the Ethernet interface can then be called, e.g. for network management.

Security

With a configurable IP access list, specific PCs and automation devices can be released for IP-based access to the CP or controller.

Configuration

For configuring the full functional scope of the CP 343-1 (6GK7343-1EX30-0XE0), STEP 7 V5.4 SP2 is required.

For configuring the functional scope of the predecessor module (6GK7343-1EX21-0XE0), STEP 7 V5.3 SP2 or higher is required. NCM S7 is completely embedded in the STEP 7 environment.

The configuration data of the CPs can be saved on the CPU. Modules can be swapped without using a programming device.

The function blocks required for communication and the programmable communications block (S7-Client) are included in the scope of supply of NCM S7 for Industrial Ethernet or can be downloaded from the Internet.
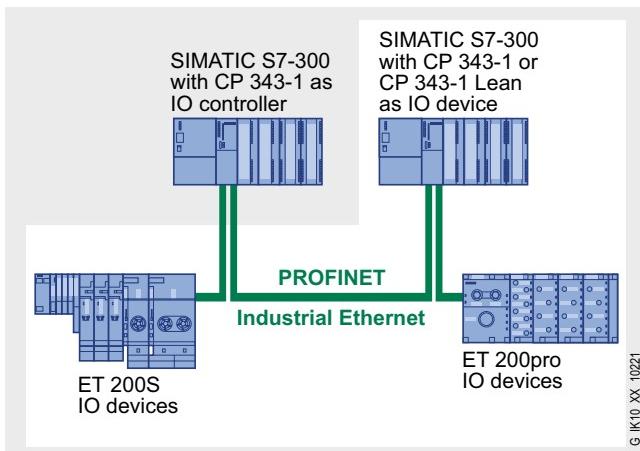
■ Integration

Line structure with CP 343-1 with integrated real-time switch as a PROFINET IO controller or IO device
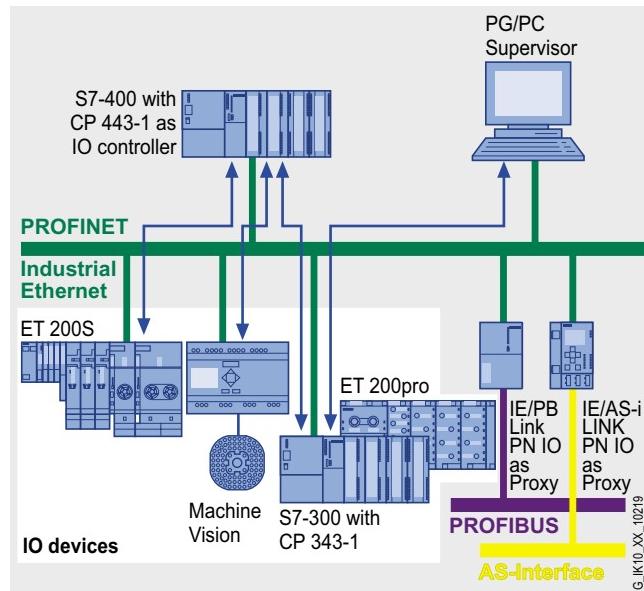
Interfacing to higher-level network with CP 343-1 as PROFINET IO controller

■ Technical specifications

Transfer rate	10/100 Mbit/s Autosensing
Interfaces	
• Communication connection, electrical	2 x RJ45 (10/100 Mbit/s; TP) Autonegotiation/Autocrossover function
• Connection for supply voltage	1 x 2-pin plug-in terminal block
Supply voltage	+24 V DC
• Permissible range	+20.4 V ... +28.8 V
Current consumption	
• from the backplane bus	200 mA
• From 24 V DC external	max. 200 mA
Power loss	5.8 W
Permissible ambient conditions	
• Operating temperature	0 °C to +60 °C
• Transport/storage temperature	-40 °C to +70 °C
• Relative humidity	Max. 95% at +25 °C
Design	
• Module format	Compact module S7-300, single width
• Dimensions (W x H x D) in mm	40 x 125 x 120
• Weight	Approx. 220 g
Configuring software	NCM S7 for Industrial Ethernet (included in the scope of delivery of STEP 7 V5.x).

Performance data

Open IE/S5-compatible communication (SEND/RECEIVE)	
• Sum of all simultaneously operable TCP/UDP connections	max. 16
• Useful data	
- TCP	8192 byte
- UDP	2048 byte
S7 communication	
• Number of connections	max. 16

PG/OP communication	
• Number of operable OP connections (acyclic services)	max. 16
Multi-protocol operation	
• Sum of all simultaneously operable connections	max. 32
Multicast	16
PROFINET communication	
PROFINET IO controller	
• Number of operable PN IO devices	32
• Size of IO data areas overall	
- IO input area	1024 byte
- IO output area	1024 byte
• Size of IO data areas per connected PN IO device	
- IO input area	Max. 240 byte
- IO output range	Max. 240 byte
• Size of IO data areas per submodule in PN IO device	
- IO input area	Max. 240 byte
- IO output range	Max. 240 byte
PROFINET IO device	
• Size of IO data ranges overall	
- IO input range	512 byte
- IO output range	512 byte
• Size of IO data areas per submodule in PN IO device	
- IO input range	Max. 240 byte
- IO output range	Max. 240 bytes
• Size of consistent range for a submodule	Max. 240 bytes
• Number of submodules in PN IO device	max. 32

PROFINET/Industrial Ethernet
System interfacing for SIMATIC and SINUMERIK

CP 343-1

2

Ordering data	Order No.		Order No.
CP 343-1 communications processor For connection of SIMATIC S7-300 to Industrial Ethernet over ISO and TCP/IP; PROFINET IO controller or PROFINET IO device, integrated 2-port switch ERTEC; S7 communication, S5-compatible communication (SEND/RECEIVE), FETCH/WRITE, with and without RFC 1006, multicast, DHCP, CPU clock synchronization via SIMATIC procedure and NTP, diagnostics, SNMP, access protection through IP access list, initialization over LAN 10/100 Mbit/s; with electronic manual on DVD	6GK7 343-1EX30-0XE0	**SOFTNET-S7 Edition 2006 for Industrial Ethernet** Software for S7 and S5-compatible communication, incl. OPC server, PG/OP communication and NCM PC; up to 64 connections, runtime software, software and electronic manual on CD-ROM, license key on diskette, Class A, for 32-bit Windows XP Professional, 2003 Server, 2000 Professional/Server; German/English	
		• Single license for 1 installation	6GK1 704-1CW64-3AA0
		• Software Update Service for 1 year, with automatic extension; requirement: Current software version	6GK1 704-1CW00-3AL0
IE FC TP Standard Cable GP 2x2 4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/ IE FC RJ45 Plug; PROFINET-compatible; with UL approval; sold by the meter	6XV1 840-2AH10	• Upgrade from V6.0 and higher to Edition 2006	6GK1 704-1CW64-3AE0
		SOFTNET-S7 Lean Edition 2006 for Industrial Ethernet Software for S7 and S5-compatible communication, incl. OPC server, PG/OP communication and NCM PC; up to 8 connections, runtime software, software and electronic manual on CD-ROM, license key on diskette, Class A, for 32-bit Windows XP Professional, 2003 Server, 2000 Professional/Server; German/English	
FO Standard Cable GP (50/125) Standard cable, splittable, UL approval, sold by the meter	6XV1 873-2A		
SCALANCE X204-2 Industrial Ethernet switch Industrial Ethernet switches with integral SNMP access, online diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; four 10/100 Mbit/s RJ45 ports and two FO ports	6GK5 204-2BB00-2AA3		
		• Single license for 1 installation	6GK1 704-1LW64-3AA0
		• Software Update Service for 1 year, with automatic extension; requirement: Current software version	6GK1 704-1LW00-3AL0
IE FC RJ45 Plug 145 RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; 145° cable outlet		• Upgrade from V6.0 and higher to Edition 2006	6GK1 704-1LW64-3AE0
		S7-1613 Edition 2006 Software for S7 and S5 communication, incl. PG/OP communication, OPC server and NCM PC; up to 120 connections, single license for 1 installation, runtime software, software and electronic manual on CD-ROM, license key on diskette, Class A, for 32-bit Windows XP Professional, 2003 Server, Windows 2000 Professional/Server; for CP 1613/CP 1613 A2 German/English	6GK1 716-1CB64-3AA0
• 1 pack = 1 unit	6GK1 901-1BB30-0AA0		
• 1 pack = 10 units	6GK1 901-1BB30-0AB0		
• 1 pack = 50 units	6GK1 901-1BB30-0AE0		
		NCM S7 configuration software V5.4 SP1 for Industrial Ethernet For execution under STEP 7 V5.4 SP1; additional Hardware Support Package (HSP)[1]; documentation on CD-ROM, with electronic manual in English, German, French, Spanish, and Italian	Included in the STEP 7 V5 package
		Documentation S7-CPs/NCM for Industrial Ethernet and PROFIBUS for V5.x (STEP 7 V5.x); paper version	
		• German	6GK7 080-0AA01-8AA0
		• English	6GK7 080-0AA01-8BA0

1) The HSP for the CP 343-1 (EX30) can be directly downloaded and installed from the Internet using STEP 7, and is already included in STEP 7 V5.4 SP2 and higher.

■ Overview

PN	ISO	TCP/IP	UDP	PG	S7	S5	IT	FTP
☐	☐	☐	☐	☐	☐	☐	☐	

- Connection of SIMATIC S7-400 to Industrial Ethernet
  - 2 x RJ45 interface for 10/100 Mbit/s full/half duplex connection with Autosensing/Autonegotiation and Autocrossover function
  - Integral real-time switch ERTEC (NEW) with two ports
  - Multi-protocol operation with ISO, TCP and UDP transport protocol and PROFINET IO
  - Adjustable Keep Alive function
- Communication services:
  - Open IE communication (ISO, TCP/IP and UDP)
  - PROFINET IO controller (NEW)
  - PG/OP communication:
    Cross-network by means of S7 routing
  - S7 communication
  - S5-compatible communication
- Multicast for UDP
- IP address assignment via DHCP, simple PC tool or via the user program (e.g. HMI)
- Access protection by means of configurable access list
- Remote programming and initial startup via Industrial Ethernet
- Support for fail-safe programmable controllers in combination with SIMATIC S7-400 CPU 416F-3PN/DP
- Diagnostic possibilities in STEP 7 and with web browser (NEW)

■ Benefits

g·e·get Designed for Industry

- Ideally suited for use in networks with a line topology through an integral 2-port real-time switch
- One slot in the rack or in the cabinet is saved due to the single-width format
- Connection of field devices to Industrial Ethernet with PROFINET
- Security:
  Protection through device-oriented IP address lists without the need for changing passwords
- Diagnostic possibilities in STEP 7, with web-based diagnosis and SNMP V2
- Modules can be replaced without the need for a programming device, as all information is stored on the CPU
- One module for different applications:
  PG/PC, HMI systems, SIMATIC S5/S7 (preferred)
- Remote programming is possible due to the WAN characteristic of TCP/IP, even via the telephone network (e.g. ISDN)
- Plant-wide time synchronization via NTP with selectable path
- Setting of intrinsic IP parameters of series machines without STEP 7
- Support for fail-safe programmable controllers in combination with SIMATIC S7-400 CPU 416F-3PN/DP

■ Application

The CP 443-1 is the communications processor for the SIMATIC S7-400 for Industrial Ethernet. With its own processor, it relieves the CPU of communications tasks and facilitates additional connections.

The CP 443-1 permits communication of the S7-400 with:

- Programming devices, computers, HMI devices
- Master computer
- Other SIMATIC S7 systems
- SIMATIC S5 programmable controllers
- Field devices (PROFINET IO devices)
- Non-Siemens devices

■ Design

The CP 443-1 offers all the advantages of SIMATIC S7-400 system design:

- Compact design;
  the rugged plastic housing features on the front:
  - Two RJ45 sockets for connection to Industrial Ethernet with automatic sensing of the data transmission rate by means of Autosensing/Autonegotiation;
    the RJ45 sockets are industrially compatible and designed with additional holding collars for connecting to the IE FC RJ45 Plug 180 or to a standard patch cable.
  - Diagnostics LEDs for indication of the operating and communication status for each switch port
- Easy installation;
  the CP 443-1 is mounted on the S7-400 rack and connected to other modules of the S7-400 by means of the backplane bus. There are no slot rules.
- The CP 443-1 can be operated without a fan.
- In combination with IM 460/461, the CP 443-1 can also be operated in an expansion rack (ER)

2

CP 443-1

■ Function

The CP 443-1 independently handles data traffic over Industrial Ethernet. The module has its own powerful processor and can be put into service directly using the unique preset Ethernet address (MAC) via the network.

Support of the DHCP (Dynamic Host Configuration Protocol) enables the IP address to be issued from a central DHCP server.

For connection control (keep alive) it is possible to configure an adjustable time for all TCP transport connections for active and passive partners.

The CPU's time can be set using NTP with an accuracy of approx. +/-1 s.

The CP 443-1 works in multi-protocol mode for the following communication services:

PG/OP communication

PG/OP communication allows all S7 stations connected to the network to be remotely programmed.

- S7 routing
  With the aid of S7 routing it is possible to use programming device communication across networks.

S7 communication

- For connecting the S7-200/300/400 (server and client), HMI devices and PCs (SOFTNET-S7 or CP 1613 A2 with S7-1613).

Communication takes place through the CP 443-1 without further configuration.

- H communication
  For redundant S7 communication, the CP 443-1 can also be used in SIMATIC H systems V4.5 or higher.

- Time synchronization
  using SIMATIC procedure or NTP (network time protocol) with selectable path.

Open IE and S5-compatible communication

On the basis of layer 4, the S5-compatible communication with SEND/RECEIVE offers a simple and optimized interface for data communication.

Up to 8 KB of data can be transmitted in one call.

The following connection possibilities can be used with this interface:

- ISO transport connections
- TCP connections with or without RFC 1006
- UDP (2 KB data length)
- Multicast for UDP (2 KB data length)

Open IE and S5-compatible communication is used with SIMATIC S5 and computers/PCs. The function calls required are a component part of STEP 7 and must be integrated in the S7 user program.

S5-compatible communication with FETCH/WRITE allows direct access to the CPU data in the same way as in the CP 1430. This means existing HMI systems can still be used.

PROFINET communication

PROFINET IO controller;
for connecting field devices over Industrial Ethernet, the CP 443-1 supports the functions of a PROFINET IO controller

Security

With a freely configurable access list, specific users and programmable controllers can be enabled for accessing the CP or control via TCP/IP.

Diagnostics

Comprehensive diagnostic options are available via STEP 7 or a web browser, including:

- General diagnostics and statistics functions
- Connection diagnostics
- Diagnosis of the assigned PROFINET field devices (also in the user program)
- LAN controller statistics
- Information about every port of the switch
- Diagnostic buffer
- Web diangosis with basic diagnostic information
- Operating status of the CP

Diagnostics possibilities during operation.

- Status scanning of connections using function block
- SNMP MIB-2 objects;
  the current status of the Ethernet interface can then be called, e.g. for network management.

Configuration

For configuring the full functional scope of the CP 443-1 (6GK7443-1EX20-0XE0), STEP 7 V5.4 SP2 or a more recent version of STEP 7 is required.

For configuring the functional scope of the predecessor module (6GK7443-1EX11-0XE0), STEP 7 V5.2 SP1 or higher is required.

The configuration data of the CPs created with STEP 7 can be stored on the CPU. Attention must however be paid to the memory volume of the S7-CPU.

Configuration and programming of all SIMATIC S7 controllers connected to the network is possible over the network.

The CP can be replaced in the event of failure without the need for a programming device because the relevant user and configuration data are saved on the CPU.
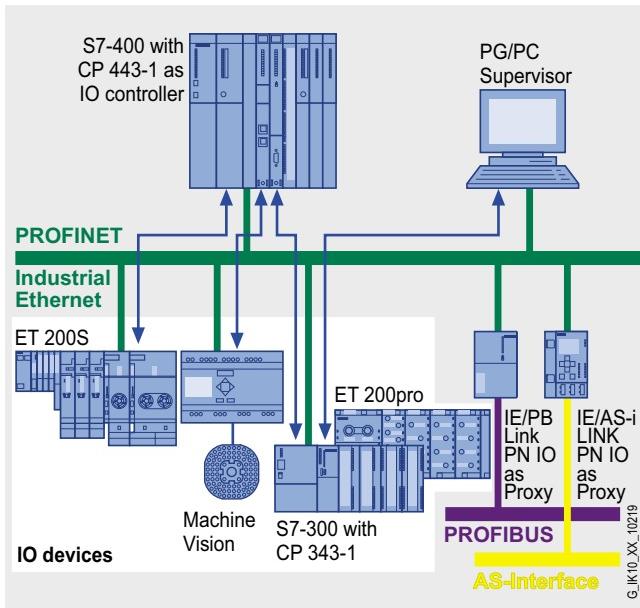
■ Integration


Interfacing to higher-level network with CP 443-1 as PROFINET IO controller
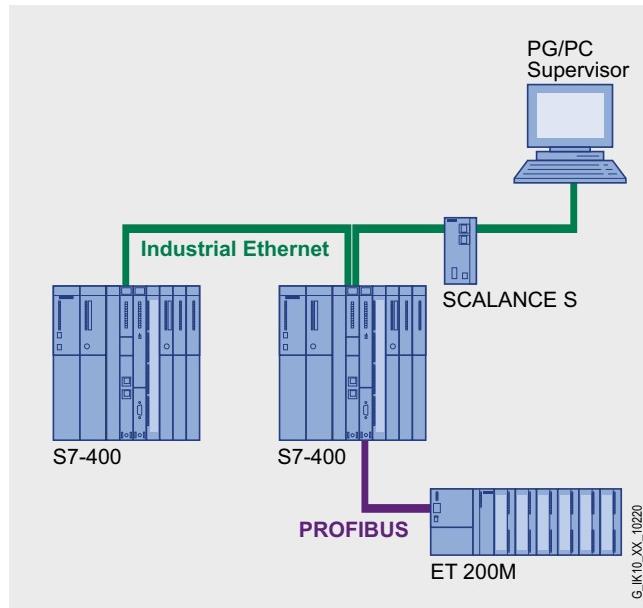
Line structure at the control level through integrated 2-port switch
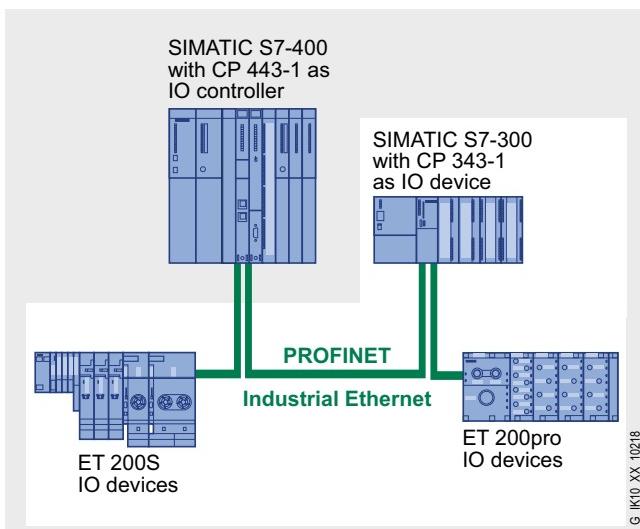
Line structure with CP 443-1 with integrated real-time switch as a PROFINET IO controller

PROFINET/Industrial Ethernet
System interfacing for SIMATIC and SINUMERIK

2

CP 443-1

■ Technical specifications	
Data transmission rate	10/100 Mbit/s Autosensing
Interfaces	
• Communication connection, electrical	1 x 15-pin Sub-D socket (10 Mbit/s AUI; 10/100 Mbit/s ITP)
	1 x RJ45 (10/100 Mbit/s; TP)
Current consumption	
• from +5 V DC (±5%)	approx. 1.4 A
• from 24 V DC (±5%)	typ. 220 mA, max. 350 mA (depending on the interface used)
Power loss	8.6 W
Permissible ambient conditions	
• Operating temperature	0 °C … +60 °C
• Transport/storage temperature	-40 °C … +70 °C
• Relative humidity	max. 95% at +25 °C
Design	
• Module format	Compact module S7-400, single width
• Dimensions (W x H x D) in mm	25 x 290 x 210
• Weight	approx. 700 g
Configuring software	NCM S7 for Industrial Ethernet (included in the scope of delivery of STEP 7 V5.x).

Performance data

Open IE/S5-compatible communication (SEND/RECEIVE)	
• Sum of all simultaneously operable ISO/TCP/UDP connections	max. 64
• Volume of user data ISO or TCP/IP	max. 8 KB
• Volume of user data UDP	max. 2 KB
• Volume of user data over ISO on TCP/IP and loadable function blocks	1452 byte[3]
S7 communication	
• Number of connections [1]	max. 128[2]
PG/OP-communication	
• Number of PG connections	max. 2
• Number of OP connections	max. 30
Multi-protocol operation	
• Sum of all simultaneously operable connections	max. 128
PROFINET communication 🆕	
PROFINET IO controller	
• Number of operable PN IO devices	128
• Number of external IO lines in one central rack	max. 4
• Size of IO data areas overall	
- IO input area	max. 4 KB
- IO output area	max. 4 KB
• Size of IO data areas per connected PN IO device:	
- IO input area	max. 240 byte
- IO output area	max. 240 byte

1) Utilization depends on the performance of the S7-CPU/FM used.
2) Several CPUs
3) Uses one S7 connection

■ Ordering data	Order No.
CP 443-1 communications processor	**6GK7 443-1EX20-0XE0**
For connecting SIMATIC S7-400 to Industrial Ethernet through TCP/IP, ISO and UDP; PROFINET IO controller; Integral real-time switch ERTEC with two ports; 2 x RJ45 interface; S7 communication, S5-compatible communication (SEND/RECEIVE) with FETCH/WRITE with and without RFC 1006, DHCP, SNMP V2, diagnostics, multicast, access protection over IP access list, initialization over LAN 10/100 Mbit/s; with electronic manual on CD-ROM	
IE FC TP Standard Cable GP 2x2	**6XV1 840-2AH10**
4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/ IE FC RJ45 Plug; PROFINET-compatible; with UL approval; sold by the meter	
FO Standard Cable GP (50/125)	**6XV1 873-2A**
Standard cable, splittable, UL approval, sold by the meter	
SCALANCE X204-2 Industrial Ethernet switch	**6GK5 204-2BB00-2AA3**
Industrial Ethernet switches with integral SNMP access, online diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; four 10/100 Mbit/s RJ45 ports and two FO ports	
IE FC RJ45 Plug 180	
RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 180° cable outlet; for network components and CPs/ CPUs with Industrial Ethernet interface	
• 1 pack = 1 unit	**6GK1 901-1BB10-2AA0**
• 1 pack = 10 units	**6GK1 901-1BB10-2AB0**
• 1 pack = 50 units	**6GK1 901-1BB10-2AE0**
SOFTNET-S7 Edition 2006 for Industrial Ethernet	
Software for S7 and S5-compatible communication, incl. OPC server, PG/OP communication and NCM PC; up to 64 connections, runtime software, software and electronic manual on CD-ROM, license key on diskette, Class A, for 32-bit Windows XP Professional, 2003 Server, 2000 Professional/Server; German/English	
• Single license for 1 installation	**6GK1 704-1CW64-3AA0**
• Software Update Service for 1 year, with automatic extension; requirement: Current software version	**6GK1 704-1CW00-3AL0**
• Upgrade from V6.0 and higher to Edition 2006	**6GK1 704-1CW64-3AE0**

Ordering data	Order No.
SOFTNET-S7 Lean Edition 2006 for Industrial Ethernet	
Software for S7 and S5-compatible communication, incl. OPC server, PG/OP communication and NCM PC; up to 8 connections, runtime software, software and electronic manual on CD-ROM, license key on diskette, Class A, for 32-bit Windows XP Professional, 2003 Server, 2000 Professional/Server; German/English	
• Single license for 1 installation	**6GK1 704-1LW64-3AA0**
• Software Update Service for 1 year, with automatic extension; requirement: Current software version	**6GK1 704-1LW00-3AL0**
S7-1613 Edition 2006	**6GK1 716-1CB64-3AA0**
Software for S7 and S5 communication, incl. PG/OP communication, OPC server and NCM PC; up to 120 connections, single license for 1 installation, runtime software, software and electronic manual on CD-ROM, license key on diskette, Class A, for 32-bit Windows XP Professional, 2003 Server, Windows 2000 Professional/Server; for CP 1613/CP 1613 A2 German/English	
NCM S7 configuration software for Industrial Ethernet	
Configuration software for Industrial Ethernet-CPs for SIMATIC S7;	
V5.x, operating under STEP 7 V5.x; on CD-ROM with electronic manual in German, English, French, Spanish, Italian	Included in the STEP 7 V5.x package
Documentation S7-CPs/NCM S7	
For Industrial Ethernet and PROFIBUS; manual package for configuring S7-CPs, IE/PB link and PC stations (STEP 7 V5.3)	
• German	**6GK7 080-0AA01-8AA0**
• English	**6GK7 080-0AA01-8BA0**

More information

The configuration software NCM S7 for Industrial Ethernet is supplied with STEP 7 V5.2.

PROFINET/Industrial Ethernet
Accessories

2

SICLOCK time synchronization

■ **Overview**

- SICLOCK TC 400 or SICLOCK TM/TS central plant clock as the central component for time synchronization of a plant over Ethernet
- SICLOCK TC 400; 🆕
  - Four independent Ethernet interfaces for supporting several Ethernet subnets
  - Significantly extended redundancy functions
  - Designed for PROFINET
- GPS or DCF77 radio clocks for direct connection to PCs, SIMATIC S7 controllers and to the SICLOCK TC 400 and SICLOCK TM/TS central plant clocks
- Pulse converter for electrical and optical distribution and interface conversion
- Complete packages for common applications

■ **Application**

Time synchronization of all components plays an important part in the automation of production plants. The SICLOCK system is a parameterizable, modular system with perfectly matched components for the time synchronization of plants. GPS (worldwide) as well as DCF77 (Germany) can be used for external radio synchronization

The modular SICLOCK system supports the time synchronization of an individual PLC through to the large plant with multiple redundancy.

Time synchronization concepts

The automation systems and operator stations of a SIMATIC PCS 7 plant or WinCC stations can be synchronized as follows with DCF77 or GPS time signals:

- Large plants;
  for large plants with many network stations and stringent requirements for timekeeping, the time synchronization is performed using a SICLOCK TC 400 or SICLOCK TM/SICLOCK TS central plant clock on the plant bus.
- Small plants;
  for small to medium-sized plants, the PCS 7 Operator Station or the WinCC Station are used as the time master, whereby the corresponding DCF or GPS radio clock is directly connected to the COM interface of the PC.
- Stand-alone systems;
  for SIMATIC S7 controllers or small systems, e.g. for laboratory automation, SICLOCK DCFS7 is a low-cost alternative to DCF77 synchronization directly over an S7 digital input.

■ **Design**

SICLOCK TC 400 and SICLOCK TM/SICLOCK TS are constructed for mounting on a SIMATIC rail. Sets of materials for installation in 19-inch racks are also available.

■ **Function**

Central plant clocks

The SICLOCK TC 400 and SICLOCK TM/SICLOCK TS central plant clocks support the synchronization of CPs and PCs with the SIMATIC procedure as well as the NTP procedure over Industrial Ethernet.

SICLOCK TC 400

SICLOCK TC 400 is used as a central plant clock for highly accurate timekeeping and distributes the time to all synchronized systems over Industrial Ethernet, as well as over three additional point-to-point connections with TTY/24 V and RS422/5 V.

The devices are equipped with four independent Ethernet interfaces. This enables separate or redundant automation networks and I&C networks to be synchronized in parallel with just one device. Apart from the well-proven standard networks such as SIMATIC NET or NTP, TC 400 is also prepared for use in PROFINET and PTCP.

Interfaces, signal types, redundancy, etc. are parameterized over the Internet/HMI. The display of statuses on the device provides fast access to the operating status and any faults.

SICLOCK TC 400 has interrupt capability and can be integrated into the I&C.

SICLOCK TM

SICLOCK TM is used as a central plant clock for highly accurate timekeeping and distributes the time to all synchronized systems over Industrial Ethernet, as well as over eight additional outputs for point-to-point connections with RS232, RS422, and TTY 20 mA.

SICLOCK TS

SICLOCK TS is used as a central plant clock for highly accurate timekeeping and distributes the time to all synchronized systems over Industrial Ethernet, as well as over three individually parameterizable outputs for point-to-point connections and IRIG A and B.

If the antenna of a radio clock fails, all SICLOCK central plant clocks continue to provide reliable timekeeping thanks to automatic changeover to highly accurate quartz operation. When the radio clock is returned to service, they accept the time signal without a time step.

SICLOCK time synchronization

Ordering data	Order No.		Order No.

SICLOCK TC 400 central plant clock (NEW)

SICLOCK TC 400 preferred packages

SICLOCK TC 400 GPS1000 — 2XV9 450-2AR10

SICLOCK TC 400 central plant clock with four Ethernet interfaces + GPS1000 radio clock
Package comprises
- SICLOCK TC 400
- SICLOCK GPS1000 system with antenna frame
- Lightning protection for GPS
Complete solution, e.g. for use in PCS 7

SICLOCK TC 400 DCF77 — 2XV9 450-2AR20

SICLOCK TC 400 central plant clock with four Ethernet interfaces + DCFRS radio clock, industrial version; package comprises
- SICLOCK TC 400
- Active DCF77 antenna with TTY output (20 mA line current) and antenna frame
- Junction box
- 1 m connecting cable mounted, extendable to 1000 m

SICLOCK TC 400 single device — 2XV9 450-2AR01
SICLOCK TC 400 central plant clock with four Ethernet interfaces

SICLOCK TM central plant clock

SICLOCK TM DCF77

SICLOCK TM central plant clock with Ethernet interface + DCFRS radio clock, industrial version; package comprises
- SICLOCK TM in stainless steel housing for rail mounting
- Active DCF77 antenna with TTY output (20 mA line current) and antenna frame
- Junction box
- 1 m connecting cable mounted, extendable to 1000 m
  - with SICLOCK TM 24 … 110 V DC — 2XV9 450-1AR26
  - with SICLOCK TM 90 … 230 V AC/DC — 2XV9 450-1AR27

SICLOCK TM GPSDEC

SICLOCK TM central plant clock with Ethernet interface + GPS-DEC radio clock, package comprises
- SICLOCK TM in stainless steel housing for rail mounting
- GPS antenna with antenna frame
- 22 m coax antenna cable (max. length 70 m, see accessories)
- GPSDEC decoder with power supply
- 5 m RS232 connection cable
- Parameterization software for PC
  - with SICLOCK TM 24 … 110 V DC — 2XV9 450-1AR24
  - with SICLOCK TM 90 … 230 V AC/DC — 2XV9 450-1AR25

SICLOCK TM central plant clock (continued)

SICLOCK TM GPS1000

SICLOCK TM central plant clock with Ethernet interface + GPS1000 radio clock, package comprises
- SICLOCK TM in stainless steel housing for rail mounting
- GPS1000 antenna head with antenna frame
- GPS1000 power supply
- 5 m RS232 connection cable
- Junction box
  - with SICLOCK TM 24 … 110 V DC — 2XV9 450-1AR50
  - with SICLOCK TM 90 … 230 V AC/DC — 2XV9 450-1AR51

SICLOCK TM single device

SICLOCK TM central plant clock with Ethernet interface, in stainless steel housing for rail mounting
- SICLOCK TM 24 … 110 V DC — 2XV9 450-1AR22
- with SICLOCK TM 90 … 230 V AC/DC — 2XV9 450-1AR23

SICLOCK TS central plant clock

SICLOCK TS GPS1000

SICLOCK TS central plant clock with Ethernet interface and IRIG A and B + GPS1000 radio clock, package comprises
- SICLOCK TS in stainless steel housing for rail mounting
- GPS1000 radio clock with antenna frame
- Junction box
  - with SICLOCK TS 24 … 110 V DC — 2XV9 450-1AR54
  - with SICLOCK TS 90 … 230 V AC/DC — 2XV9 450-1AR55

SICLOCK TS single device

SICLOCK TS central plant clock with Ethernet interface and IRIG A and B in stainless steel housing for rail mounting
- SICLOCK TS 24 … 110 V DC — 2XV9 450-1AR52
- SICLOCK TS 90 … 230 V AC/DC — 2XV9 450-1AR53

PROFINET/Industrial Ethernet
Accessories

2

SICLOCK time synchronization

■ **Ordering data**   Order No.   Order No.

DCF radio clocks

SICLOCK DCFRS, radio clock, industrial version	**2XV9 450-1AR21**
DCF radio clock for time synchronization of individual PCs or servers in industrial environments with high levels of interference; distances of up to 1000 m are possible between the DCF radio clock and the PC, package comprises	
• Active DCF77 antenna with TTY output (20 mA line current) and antenna frame	
• TTY/RS232 converter	
• Plug-in power supply	
• Two junction boxes	
• 1 m connecting cable mounted, extendable to 1000 m	
• DCF77 receiving service for Windows NT/2000/2003/XP	
SICLOCK DCFRS, radio clock for Windows	**2XV9 450-1AR14**
DCF radio clock for the time synchronization of individual PCs over short distances, package comprises	
• Active DCF77 antennas with RS232 interface Mounting bracket	
• 20 m connecting cable mounted	
• DCF77 receiving service for Windows NT/2000/2003/XP	
SICLOCK DCFEMP, receiver with TTY interface	**2XV9 450-1AR61**
DCF receiver for connection to existing HF cable system in the plant for DCF77 time signals for time synchronization of individual PCs or servers at distances of up to 1000 m, package comprises	
• Active DCF77 receiver with mounting bracket and TTY interface	
• 1 m connecting cable mounted	
SICLOCK DCFS7	**2XV9 450-1AR36**
Low-cost solution for time synchronization of SIMATIC S7-300/400 over DCF77 over one digital input, package comprises	
• SICLOCK DCFRS, radio clock with RS232 output, 20 m connecting cable and mounting bracket	
• SICLOCK DCFS7 interface	
• SICLOCK DCFS7 receiving service (STEP 7 function block for integration in S7 software)	

Accessories for SICLOCK DCFS7

SICLOCK DCFS7 interface + receiving service	**2XV9 450-1AR30**
(STEP 7 function block for integration in S7 software)	
SICLOCK DCFS7 interface	**2XV9 450-1AR35**
SICLOCK DCFS7 receiving service	**2XV9 450-1AR32**
(STEP 7 function block for integration in S7 software)	

GPS radio clocks

SICLOCK WINGPS, radio clock for Windows	**2XV9 450-1AR13**
GPS radio clock for the time synchronization of individual PCs in industrial environments with high levels of interference, package comprises	
• GPS antenna with antenna frame	
• WINGPS decoder with power supply	
• 22 m coax antenna cable (max. length 70 m, see accessories)	
• 20 m PC connection cable WINGPS	
• DCF77 receiving service for Windows NT/2000/2003/XP	
SICLOCK GPSDEC, radio clock for Windows	**2XV9 450-1AR00**
GPS radio clock for the time synchronization of the SICLOCK TM/TS central plant clocks or programmable logic controllers in industrial environments with high levels of interference, package comprises	
• GPS antenna with antenna frame	
• GPSDEC decoder with power supply	
• 22 m coax antenna cable (max. length 70 m, see accessories)	
• 5 m RS232 connecting cable	
• Parameterization program	
GPS1000 + power supply, radio clock for Windows	**2XV9 450-1AR82**
GPS radio clock for the time synchronization of PCs, programmable controllers, as well as the SICLOCK TM and SICLOCK TS central plant clocks in industrial environments with high levels of interference with distances up to 1000 m between the antenna and the device, package comprises	
• GPS1000 antenna head with antenna frame	
• GPS1000 power supply	
• Junction box	
• 5 m RS232 connecting cable	
• DCF77 receiving service for Windows NT/2000/2003/XP	

SICLOCK time synchronization

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Ordering data — Order No.

Accessories

Set of materials for SICLOCK TM/TS
- For desktop housing — **2XV9 450-1AR80**
- for 19" mounting frame (4 HU) — **2XV9 450-1AR81**

Lightning protection for antenna cable
- Lightning protection for coaxial antenna cable (SICLOCK GPS-DEC/WINGPS) — **2XV9 450-1AR11**
- Lightning protection for TTY connecting cable (SICLOCK GPS1000/DCFRS industrial version) — **2XV9 450-1AR83**
- Lightning protection for RS232 antenna cable (SICLOCK DCFS7/DCFRS with RS232 interface) — **2XV9 450-1AR15**

Coaxial antenna cable SICLOCK GPSDEC/WINGPS
- 30 m — **2XV9 450-1AR12**
- 70 m — **2XV9 450-1AR07**

Software

SICLOCK DCF77 receiving service for Windows — **2XV9 450-1AR28**

SICLOCK Ethernet receiving service for Windows NT — **2XV9 450-1AR44**

Pulse converter

SICLOCK EOPC
Electrical/optical pulse converter for industrial applications with 32 fiber-optic cable outlets for transparent operation and pulse mode
- SICLOCK EOPC 24 … 110 V DC — **2XV9 450-1AR72**
- SICLOCK EOPC 90 … 230 V AC/DC — **2XV9 450-1AR73**

SICLOCK PCON
Single-channel electrical/optical pulse converter for industrial applications
- SICLOCK PCON 24 … 230 V AC/DC, with multi-mode fiberglass connection, 820 nm — **2XV9 450-1AR63-1SA0**
- SICLOCK PCON 24 … 230 V AC/DC, long distance, with multi-mode fiberglass connection, 1310 nm — **2XV9 450-1AR63-1MA0**

SICLOCK DCFHF — **2XV9 450-1AR64**
HF modulator for DCF77 signals for industrial applications

Displays

SICLOCK DA1000 NET
Digital display with Ethernet connection for date and time
- Red display — **2XV9 450-1AR68**

SICLOCK DA1000
Digital display for date and time
- Red display — **2XV9 450-1AR65**
- Green display — **2XV9 450-1AR66**

More information

SIEMENS AG

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SICLOCK hotline
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Fax: +49 (0)9131 18-80604
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Additional information is available in the Internet under:

http://www.siemens.com/siclock

PROFINET/Industrial Ethernet
Distributed I/O ET 200S

2

IM 151-3PN interface module

■ **Overview**

- Interface module for linking the ET 200S to PROFINET
- Handles all data exchange with the PROFIBUS I/O controller
- 3 versions:
  - IM151-3 PN STANDARD
  - IM151-3 PN HIGH FEATURE and IM 151-3 PN FO: *NEW* supports, in contrast to the STANDARD version, the operation of PROFIsafe F modules
- with integrated 2-port switch for line topology

Note:
Micro Memory Card required for operation.

■ **Technical specifications**

	6ES7 151-3AA22-0AB0	6ES7 151-3BA22-0AB0	6ES7 151-3BB22-0AB0 *NEW*
Supply voltages			
Supply voltage of electronics 1L+			
• Rated value (DC)	24 V	24 V	24 V
• reverse polarity protection	Yes	Yes	Yes
Voltages and currents			
Mains/voltage failure jumpering, min.	20 ms	20 ms	20 ms
Current consumption			
from supply voltage 1L+, max.	250 mA	250 mA	200 mA
Power loss, typ.	2.5 W	2.5 W	3 W
Address area			
Adressing volume			
• Outputs	256 Byte	256 Byte	256 Byte
• Inputs	256 Byte	256 Byte	256 Byte
Connection point			
RJ45	Yes	Yes	No
Protocols			
PROFINET IO	Yes	Yes	Yes
PROFINET IO			
Transmission speed, max.	100 Mbit/s	100 Mbit/s	100 Mbit/s
automatic detection of transmission speed	Yes	Yes	Yes
Isochronous mode			
Isochronouos mode	No	No	No

Technical specifications (continued)

	6ES7 151-3AA22-0AB0	6ES7 151-3BA22-0AB0	6ES7 151-3BB22-0AB0 NEW
Status information/alarms/ diagnostics			
Alarms			
• Alarms	Yes	Yes	Yes
Diagnoses			
• Diagnostic functions	Yes	Yes	Yes
Diagnostics indication LED			
• Bus error BF (red)	Yes	Yes	Yes
• Collective error SF (red)	Yes	Yes	Yes
• Monitoring 24 V voltage supply ON (green)	Yes	Yes	Yes
• Connection to network LINK (green)	Yes	Yes	Yes
• Transmit/receive RX/TX (yellow)	Yes	Yes	Yes
Isolation			
between backplane bus and electronics	No	No	No
between Ethernet and electronics	Yes	Yes	Yes
between supply voltage and electronics	No	No	No
General information			
Vendor identification (VendorID)	002AH	002AH	002AH
Device identifier (DeviceID)	0301	0301H	0301H
Dimensions			
Width	60 mm	60 mm	60 mm
Height	119.5 mm	119.5 mm	119.5 mm
Depth	75 mm	75 mm	75 mm
Weights			
Weight, approx.	120 g	135 g	150 g

PROFINET/Industrial Ethernet
Distributed I/O ET 200S

2

IM 151-3PN interface module

Ordering data	Order No.		Order No.
IM 151-3 PN interface module For ET 200S; transfer rates up to 100 Mbit/s; data volume depends on the number of modules inserted, up to 63 modules can be connected, bus connection through RJ45	6ES7 151-3AA22-0AB0	**Termination Kit SC RJ POF Plug** Assembly case for on-site assembly of SC RJ plugs consisting of stripping tool, buffer stripping tool, kevlar cutter, fiber breaking tool, microscope	6GK1 900-0NL00-0AA0
IM 151-3 PN PROFINET High Feature interface module for ET 200S; transfer rate up to 100 Mbit/s; max. 63 modules up to 2 m wide can be connected; bus connection via RJ45, incl. terminating module	6ES7 151-3BA22-0AB0	**Industrial Ethernet SC RJ PCF Plug** Screw-in plug for on-site assembly to PCF fiber optic cable (1 pack = 10 units)	6GK1 900-0NB00-0AC0
IM 151-3 FO interface module for ET 200S; with 2 PROFINET FO-interfaces and integrated 2-port switch, max. 63 modules up to 2 m wide can be connected, incl. terminating module	6ES7 151-3BB22-0AB0 NEW	**Industrial Ethernet FastConnect stripping tool**	6GK1 901-1GA00
		MMC 64 KB [1] For storing the device name	6ES7 953-8LF20-0AA0
Accessories		**MMC 128 KB** [1] For storing the device name	6ES7 953-8LG11-0AA0
Industrial Ethernet FC RJ45 Plug 90 RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 90° cable outlet		**MMC 512 KB** [1] For storing the device name	6ES7 953-8LJ20-0AA0
		MMC 2 MB [1] For storing the device name and/or firmware update	6ES7 953-8LL20-0AA0
• 1 unit	6GK1 901-1BB20-2AA0	**MMC 4 MB** [1] For storing the device name and/or firmware update	6ES7 953-8LM20-0AA0
• 10 units	6GK1 901-1BB20-2AB0	**MMC 8 MB** [1] For storing the device name and/or firmware update	6ES7 953-8LP20-0AA0
• 50 units	6GK1 901-1BB20-2AE0	**ET 200S distributed I/O system manuals**	are available on the Internet as PDF files: *http://www.siemens.de/simatic-doku*
Industrial Ethernet FastConnect installation cables			
• Fast Connect standard cable	6XV1 840-2AH10		
• Fast Connect trailing cable	6XV1 840-3AH10	**SIMATIC Manual Collection** Electronic manuals on DVD, multi-language: S7-200, TD 200, S7-300, M7-300, C7, S7-400, M7-400, STEP 7, Engineering Tools, Runtime Software, SIMATIC DP (Distributed I/O), SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication)	6ES7 998-8XC01-8YE0
• Fast Connect marine cable	6XV1 840-4AH10		
Termination Kits **SC RJ POF Plug** Assembly case for on-site assembly of SC RJ plugs consisting of stripping tool, kevlar cutter, microscope, abrasive paper, grinding support	6GK1 900-0ML00-0AA0		
IE SC RJ POF Plug Screw-in plug for on-site assembly to POF fiber optic cable (1 pack = 20 units)	6GK1 900-0MB00-0AC0	**SIMATIC Manual Collection – Update service for 1 year** Scope of delivery: Current DVD "S7 Manual Collection" and the three subsequent updates	6ES7 998-8XC01-8YE2
IE SC RJ Refill Set POF Refill set for Termination Kit SC RJ POF Plug, consisting of abrasive paper and grinding plate (set of 5)	6GK1 900-0MN00-0AA0		

1) For operating the IM 151-3, an MMC is essential

Ordering data	**Order No.**		**Order No.**
Label sheets DIN A4 (10 units)		**Industrial Ethernet Switches SCALANCE X-200IRT**	
Each sheet contains 60 label strips for peripheral modules and 20 label strips for interface modules		Managed Industrial Ethernet Switches; Isochronous Real-Time, LED diagnostics, error signaling contact with SET button, redundant voltage supply SCALANCE X202-2P IRT; 2 x 10/100 Mbit/s RJ45 ports, 2 x 100 Mbit/s POF/PCF SC RJ	
• petrol	**6ES7 193-4BH00-0AA0**		
• red	**6ES7 193-4BD00-0AA0**		
• yellow	**6ES7 193-4BB00-0AA0**	• **SCALANCE X202-2P IRT;** 2 x 10/100 Mbit/s RJ45 ports, 2 x 100 Mbit/s POF/PCF SC RJ	**6GK5 202-2BH00-2BA3**
• light beige	**6ES7 193-4BA00-0AA0**		
Terminating module	**6ES7 193-4JA00-0AA0**	• **SCALANCE X201-3P IRT;** 1 x 10/100 Mbit/s RJ45 ports, 3 x 100 Mbit/s POF/PCF SC RJ	**6GK5 201-3BH00-2BA3**
as spare part for ET 200S			
DIN rail 35 mm		• **SCALANCE X200-4P IRT;** 4 x 100 Mbit/s POF/PCF SC RJ	**6GK5 200-4AH00-2BA3**
• Length: 483 mm for 19'' cabinets	**6ES5 710-8MA11**		
• Length: 530 mm for 600 mm cabinets	**6ES5 710-8MA21**		
• Length: 830 mm for 900 mm cabinets	**6ES5 710-8MA31**		
• Length: 2 m	**6ES5 710-8MA41**		

PROFINET/Industrial Ethernet

ET 200pro

2

IM 154-8 PN/DP CPU interface module

■ **Overview**

- PROFINET IO controller to operate distributed I/Os on PROFINET
- Component based Automation (CBA) on PROFINET
- PROFINET proxy for intelligent devices on PROFIBUS DP in Component Based Automation (CBA)
- CPU with PLC functionality equivalent to S7-315-2 PN/DP, provides distributed intelligence for preprocessing
- Interface module to exchange preprocessed I/O data from ET 200pro with a higher-level master through PROFIBUS DP
- Fast, simple and end-to-end programming of a system with modular programs via STEP 7

Micro Memory Card required for operation of CPU.

■ **Technical specifications**

	6ES7 154-8AB00-0AB0
Revision level	
Associated programming package	STEP 7 V5.4 SP1 with hardware update
Supply voltages	
Rated value	
• 24 V DC	Yes
• Permissible range, lower limit (DC)	20.4 V
• Permissible range, upper limit (DC)	28.8 V
Voltages and currents	
External protection for supply lines (recommended)	24 V DC circuit breaker / 16 A with tripping characteristic type B and C (see ET 200pro Manual)
Current consumption	
Starting current, type	2 A; typical
I²t	0.04 A²s; typical
Current consumption (nominal value)	350 mA; typical
Power loss, typ.	8.5 A²s; typical
Memory	
Memory type	
• Work memory	
- Integrated	256 KB
- Expandable	No
• Load memory	
- Plug-in (MMC)	Yes
- Plug-in (MMC), max.	8 MB
Buffer	
• Available	Yes
• Without battery	Yes
CPU/ Chips	
DB	
• Number, max.	1,023; Number range: 1 to 1023
• Size, max.	16 KB
FB	
• Number, max.	1,024; number range: 0 to 2047
• Size, max.	16 KB
FC	
• Number, max.	1,024; number range: 0 to 2047
• Size, max.	16 KB
OB	
• Size, max.	16 KB

	6ES7 154-8AB00-0AB0
Nesting depth	
• Per priority class	8
• Additionally within an error OB	4
CPU/ Processing times	
For bit operations, min.	0.1 µs
For word operations, min.	0.2 µs
For fixed point arithmetic, min.	2 µs
For floating point arithmetic, min.	3 µs
Timers/counters and their retentivity	
S7 counters	
• Number	256
• Of which retentive without battery	
- Adjustable	Yes
- Lower limit	0
- Upper limit	255
• Retentivity	
- Adjustable	Yes
- Lower limit	0
- Upper limit	255
• Counting range	
- Adjustable	Yes
- Lower limit	0
- Upper limit	999
IEC counter	
• Available	Yes
• Type	SFB
S7 times	
• Number	256
• Retentivity	
- Adjustable	Yes
- Lower limit	0
- Upper limit	128
- Pre-selected	No retentivity
• Time range	
- Lower limit	10 ms
- Upper limit	9,990 s
IEC timers	
• Available	Yes
• Type	SFB

PROFINET/Industrial Ethernet
ET 200pro

IM 154-8 PN/DP CPU interface module

Technical specifications (continued)

	6ES7 154-8AB00-0AB0
Data areas and their retentivity	
Bit memories	
• Number, max.	2,048 bytes
• Retentivity available	Yes; MB 0 to MB 2047
• Number of clock memories	8
Data blocks	
• Number, max.	1,023; from DB 1 to DB 1023
• Size, max.	16 KB
• Retentivity adjustable	Yes; from DB 1 to DB 1023
• Retentivity pre-selected	Yes
Local data	
• Per priority class, max.	1,024 bytes; per module max. 510
Addressing range	
I/O addressing range	
• Inputs	2,048 bytes
• Outputs	2,048 bytes
• Of which distributed	
- Inputs	2,048 bytes
- Outputs	2,048 bytes
Process image	
• Inputs, adjustable	2,048 bytes
• Outputs, adjustable	2,048 bytes
• Inputs, pre-selected	128 bytes
• Outputs, pre-selected	128 bytes
Process image partition	
• Number of partial process image, max.	1
Digital channels	
• Inputs	16.384
• Outputs	16.384
• Inputs, of which central	128
• Outputs, of which central	64
Analog channels	
• Inputs	1.024
• Outputs	1.024
• Inputs, of which central	64
• Outputs, of which central	64
Hardware configuration	
Module rack, max.	1
Modules per rack, max.	16; Expansion width, max. 1m
No. of DP masters	
• Integrated	1
Time	
Clock	
• Real-time clock	Yes
• Buffered and synchronized	Yes; to MPI: master/slave; to DP: In operation as DP master: master/slave; on PROFINET: Via NTP (client only)
• Fluctuation per day, max.	10 s
Runtime meter	
• Number	1
• Value range	2 to the power of 31 hours (when using the SFC 101)
• Granularity	1 h
• Retentive	Yes; must be restarted at each restart.
Time synchronization	
• Supported	Yes
• On MPI, master	Yes

	6ES7 154-8AB00-0AB0
• On MPI, slave	Yes
• In AS, master	No
• In AS, slave	No
• on Ethernet via NTP	Yes; as client
S7 alarm functions	
Number of connectable stations for message functions, max.	16
Process error diagnostic messages	Yes
Simultaneously active alarm S modules, max.	40
Test and commissioning functions	
Status Force	
• Status/Modify variable	Yes
• Variables	Inputs, outputs, bit memories, DB, timers, counters
• Number of variables, max.	30
• Of which are Status Variable, max.	30
• Of which are Modify Variable, max.	14
Forcing	
• Forcing	Yes
• Forcing, variables	I/O
• Number of variables, max.	10
Status Block	Yes
Single step	Yes
Number of breakpoints	2
Diagnostic buffer	
• Available	Yes
• Number of entries, max.	500
• Adjustable	No
Communication functions	
PG/OP communication	Yes
Routing	Yes
Shared data communication	
• Supported	Yes
• GD package size, max.	22 bytes
S7 basic communication	
• Supported	Yes
S7 communication	
• Supported	Yes
Open IE communication	
• TCP/IP	Yes
- Number of connections, max.	8
- Data lengths, max.	8 KB
• ISO-on-TCP (RFC1006)	Yes
- Number of connections, max.	8
- Data lengths, max.	8 KB
• UDP	Yes
- Number of connections, max.	8
- Data lengths, max.	1,472 KB
Number of connections	
• Total	16
• Applicable for PG communication	15
• Applicable for OP communication	15
• Applicable for S7 basic communication	14
PROFINET CBA (for set reference communication load)	
• Target setting for CPU communication load	50%

PROFINET/Industrial Ethernet
ET 200pro

IM 154-8 PN/DP CPU interface module

2

■ **Technical specifications** (continued)

	6ES7 154-8AB00-0AB0
• Number of remote interconnection partners	32
• Number of master/slave functions	30
• Total of all master/slave connections	1.000
• Data lengths of all incoming master/slave connections, max.	4,000 bytes
• Data lengths of all outgoing master/slave connections, max.	4,000 bytes
• Number of internal and PROFIBUS interconnections	500
• Data lengths of internal and PROFIBUS interconnections, max.	4,000 bytes
• Data lengths per connection, max.	1,400 bytes
• Remote connections with acyclic transmission	
- Scanning frequency: Scanning interval, min.	500 ms
- Number of incoming interconnections	100
- Number of outgoing interconnections	100
- Data lengths of all incoming interconnections, max.	2,000 bytes
- Data lengths of all outgoing interconnections, max.	2,000 bytes
- Data lengths per connection, max.	1,400 bytes
• Remote connections with cyclic transmission	
- Transfer frequency: Transmission interval, min.	1 ms
- Number of incoming interconnections	200
- Number of outgoing interconnections	200
- Data lengths of all incoming interconnections, max.	2,000 bytes
- Data lengths of all outgoing interconnections, max.	2,000 bytes
- Data lengths per connection, max.	250 bytes
• HMI variables via PROFINET (acyclic)	
- Number of connectable stations for HMI variables (PN OPC/iMap)	3; 2 * PN OPC / 1 * iMap
- HMI variable update	500 ms
- Number of HMI variables	200
- Data lengths of all HMI variables, max.	2,000 bytes
• PROFIBUS proxy functionality	
- Supported	Yes
- Number of connected PROFI-BUS devices	16
- Data lengths per connection, max.	240 bytes
1st interface	
Interface type	Integrated RS 485 interface
Physical	RS 485
Electrically isolated	Yes
Functionality	
• MPI	Yes
• DP master	Yes
• DP slave	Yes
• Point-to-point link	No

	6ES7 154-8AB00-0AB0
MPI	
• Number of connections	16
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Shared data communication	Yes
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
• Transmission rates, max.	12 Mbit/s
DP master	
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Shared data communication	No
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- Equidistance support	Yes
- SYNC/FREEZE	Yes
- Enabling/disabling DP slaves	Yes
- DPV1	Yes
• Transmission rates, max.	12 Mbit/s
• Number of DP slaves, max.	124
DP slave	
• Services	
- Routing	Yes
- Shared data communication	No
- S7 basic communication	No
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- Direct data exchange	Yes
- DPV1	No
• Transmission rates, max.	12 Mbit/s
• Transfer memory	
- Inputs	244 bytes
- Outputs	244 bytes
• Address range, max.	32
2nd interface	
Interface type	PROFINET
Physical	Ethernet
Electrically isolated	Yes
Automatic calculation of the transmission rate	Yes
Functionality	
• MPI	No
• DP master	No
• DP slave	No
• PROFINET IO controller	Yes
• PROFINET CBA	Yes
• Point-to-point link	No
PROFINET CBA	
• Acyclic transmission	Yes
• Cyclical transmission	Yes

▮ Technical specifications (continued)

	6ES7 154-8AB00-0AB0
PROFINET IO controller	
• Services	
- PG/OP communication	Yes
- Routing	Yes
- S7 communication	Yes
- Open IE communication	Yes
• Transmission rate, max.	100 MB/s
• Number of connectable I/O devices, max.	128
• Addressing range	
- Inputs, max.	2,048 bytes
- Outputs, max.	2,048 bytes
• User data consistency, max.	256 bytes
CPU/ Programming	
Programming language	
• STEP 7	Yes; as of V 5.3 SP1 + HW support package
• LAD	Yes
• FBD	Yes
• STL	Yes
• SCL	Yes
• CFC	Yes
• GRAPH	Yes
• HiGraph®	Yes

	6ES7 154-8AB00-0AB0
Software libraries	
Operation set	See operations list
Nesting levels	8
User program protection/password protection	Yes
System functions (SFC)	See operations list
System function modules (SFB)	See operations list
Isolation	
Between rear panel bus and all other switching components	Yes
Between rear panel bus and electronics	No
Between power supply and all other circuits	Yes
Degree of protection	
IP20 rear panel	Yes
Dimensions	
Width	135 mm
Height	130 mm
Depth	65 mm
Weights	
Weight, approx.	555 g

▮ Ordering data

	Order No.		Order No.
IM 154-8 PN/DP CPU interface module	**6ES7 154-8AB00-0AB0**	**Industrial Ethernet FastConnect Stripping Tool**	**6GK1 901-1GA00**
PROFINET IO controller to operate distributed I/Os on PROFINET, with integrated PLC functionality		**IE Connecting Cable M12-180/M12-180**	
Accessories		Preassembled IE FC TP Trailing Cable GP 2 x 2 (PROFINET Type C) with two 4-pin M12 plugs (4-pin, D-coded), degree of protection IP65/IP67, length:	
Connection module	**6ES7 194-4AN00-0AA0**	• 0.3 m	**6XV1 870-8AE30**
For CPU IM154-8 PN/DP, with 4 x M12 and 2 x 7/8", to connect PROFINET and PROFIBUS DP		• 0.5 m	**6XV1 870-8AE50**
		• 1.0 m	**6XV1 870-8AH10**
SCALANCE X-200 Industrial Ethernet Switches		• 1.5 m	**6XV1 870-8AH15**
With integral SNMP access, Web diagnosis, copper cable diagnosis and PROFINET diagnosis, for setting up linear, star and ring structures		• 2.0 m	**6XV1 870-8AH20**
		• 3.0 m	**6XV1 870-8AH30**
• SCALANCE X208PRO, in degree of protection IP65, with eight 10/100 Mbit/s M12 ports, incl. eleven M12 dust caps	**6GK5 208-0HA00-2AA6**	• 5.0 m	**6XV1 870-8AH50**
		• 10 m	**6XV1 870-8AN10**
		• 15 m	**6XV1 870-8AN15**
Industrial Ethernet FC RJ45 Plug 180		**IE M12 Plug PRO**	
RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 180° cable outlet		M12 plug-in connector suitable for on-site assembly (D-coded), metal enclosure, fast connection, for SCALANCE X208PRO and IM 154-4 PN	
		• 1 units	**6GK1 901-0DB10-6AA0**
• 1 unit	**6GK1 901-1BB10-2AA0**	• 8 units	**6GK1 901-0DB10-6AA8**
• 10 units	**6GK1 901-1BB10-2AB0**	**IE panel feedthrough**	
• 50 units	**6GK1 901-1BB20-2AE0**	Cabinet feedthrough for converting from the M12 connection system (D-coded, IP65/IP67) to the RJ45 connection system (IP20), 1 pack = 5 units	**6GK1 901-0DM20-2AA5**
Industrial Ethernet FastConnect installation cables			
• Fast Connect standard cable	**6XV1 840-2AH10**		
• Fast Connect trailing cable	**6XV1 840-3AH10**		
• Fast Connect marine cable	**6XV1 840-4AH10**		

PROFINET/Industrial Ethernet
ET 200M

IM 153-4 PN

Overview

- To connect ET 200M to PROFINET IO (via copper line, RJ45) as an IO device
- Integrated 2-port switch
- 12 modules per station
- Usable I/O capacity: 192 byte each
- Active bus backplane to hot-swap modules available as an option
- Baud rate 10 Mbit/s / 100 Mbit/s (autonegotiation / full duplex)
- I&M functions according to PNO Guideline Order No. 3.502, Version V1.1

Technical specifications

	6ES7 153-4AA00-0XB0
Supply voltages	
Rated value	
• DC 24 V	Yes
Power supply and voltage jumpering	
• Mains/voltage failure jumpering	5 ms
Current consumption	
Current consumption, max.	600 mA
Power loss, typ.	6 W
Address area	
Adressing volume	
• Outputs	192 Byte
• Inputs	192 Byte
Hardware config.	
Number of modules per DP slave interface, max.	12
Status information/alarms/diagnostics	
Diagnostics indication LED	
• Connection to network LINK (green)	Yes
• Transmit/receive RX/TX (yellow)	Yes
Environmental requirements	
Operating termperature	
• min.	0 °C
• max.	60 °C
Degree and class of protection	
• IP 20	Yes
Dimensions	
Width	40 mm
Height	125 mm
Depth	118 mm
Weights	
Weight, approx.	215 g

IM 153-4 PN

Ordering data	Order No.		Order No.
IM 153-4 PN interface module I/O device to connect an ET 200M to PROFINET	**6ES7 153-4AA00-0XB0**	**S7 Manual Collection** Electronic manuals on DVD, multi-language: S7-200, TD 200, S7-300, M7-300, C7, S7-400, M7-400, STEP 7, Engineering Tools, Runtime Software, SIMATIC DP (Distributed I/O), SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication)	**6ES7 998-8XC01-8YE0**
Accessories			
Bus modules for ET 200M			
• To accommodate a power supply and an IM 153 for the hot-swapping function during RUN, incl. bus module cover	**6ES7 195-7HA00-0XA0**		
• To accommodate two 40 mm wide I/O modules for the swapping function	**6ES7 195-7HB00-0XA0**	**S7 Manual Collection update service for 1 year** Scope of delivery: Current DVD "S7 Manual Collection" and the three subsequent updates	**6ES7 998-8XC01-8YE2**
• To accommodate one 80 mm wide I/O module for the swapping function	**6ES7 195-7HC00-0XA0**		
SIMATIC Micro Memory Card 64 KB[1]	**6ES7 953-8LF20-0AA0**	**Industrial Ethernet FC RJ45 Plug 90** RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 90° cable outlet	
SIMATIC DP DIN rail for ET 200M To accommodate up to 5 bus modules for			
• Length 483 mm	**6ES7 195-1GA00-0XA0**	• 1 unit	**6GK1 901-1BB20-2AA0**
• Length 530 mm	**6ES7 195-1GF30-0XA0**	• 10 units	**6GK1 901-1BB20-2AB0**
SIMATIC S7-300 DIN rail		• 50 units	**6GK1 901-1BB20-2AE0**
• Length 160 mm	**6ES7 390-1AB60-0AA0**	**Industrial Ethernet FastConnect installation cables**	
• Length 480 mm	**6ES7 390-1AE80-0AA0**	• FastConnect standard cable	**6XV1 840-2AH10**
• Length 530 mm	**6ES7 390-1AF30-0AA0**	• FastConnect trailing cable	**6XV1 840-3AH10**
• Length 830 mm	**6ES7 390-1AJ30-0AA0**	• FastConnect marine cable	**6XV1 840-4AH10**
• Length 2,000 mm	**6ES7 390-1BC00-0AA0**	**Industrial Ethernet Fast Connect Stripping Tool**	**6GK1 901-1GA00**

1) To operate the IM153-4, an MMC is required with at least 64 KB memory. Cards with higher memory capacity may also be used.

PROFINET/Industrial Ethernet
SIMOTION Motion Control System

2

SIMOTION P350-3

■ Overview

SIMOTION P350-3 is a PC-based motion control system. The use of an industrial PC platform facilitates the running of the SIMOTION machine application (comprising controller, motion control and HMI functions) alongside standard PC applications on one and the same platform. This is particularly useful in the case of applications that involve complex PC-based data management and analysis systems.

The operating system is Windows XP Professional, with a real-time expansion for SIMOTION.

To facilitate the connection of distributed components, SIMOTION P350-3 is available in both PROFINET and PROFIBUS versions.

■ Design

Interfaces

Display and diagnostics

With SIMOTION P, the display and diagnostics functions for the operating states are performed by a software monitor, which takes the form of an on-screen application window. This software monitor can be operated using your keyboard or mouse.

Integrated interfaces

- 1 x COM 1 (V.24), VGA (via DVI adapter)
- 4 x USB 2.0
- 1 x MPI/PROFIBUS DP interface (integrated, not isochronous, optically isolated)
- 2 x Industrial Ethernet 10/100 Mbps (integrated)

Expansion slots

- 1 x PCI slot 265 mm
  PROFINET version: occupied by MCI-PN communication board
  PROFIBUS version: occupied by IsoPROFIBUS board
- 1 x PCI/ISA slot 170 mm (free)
  e.g., for the purpose of retrofitting an additional communication board

Communication

PROFINET version
The MCI PN communication board that has been integrated in the PROFINET version enables the SIMOTION P350-3 to be connected to a PROFINET IO network. From a PROFINET perspective, the SIMOTION P350-3 thus assumes the role of a PROFINET IO controller.

To enable it to communicate with other PROFINET controllers, the SIMOTION P350-3 can be configured as both a controller and a device at the same time (iDevice).

PROFIBUS version
The PROFIBUS version features an integrated IsoPROFIBUS board, which offers two PROFIBUS DP interfaces for establishing PROFIdrive connections.

The free PCI slot can be used for the purpose of retrofitting an optional MCI-PN communication board. This means that the PROFIBUS version can support both PROFIBUS and PROFINET on the same PC.

Compatible panel fronts

SIMOTION P350-3 can be connected to the following panel fronts:

- 12" with membrane-type keys
- 12" for touch screen operation
- 15" with membrane-type keys
- 15" for touch screen operation

The DVI/VGA interface can be used to connect an external monitor.

Expansion using distributed I/Os

PROFINET version

- Distributed I/Os (SIMATIC ET 200S/M/pro)
- Distributed drives (e.g., SINAMICS S120 Motor Modules with CU320 Control Unit and CBE20 Communication Board plus SINAMICS S120 Power Modules and CU310 PN Control Unit)
- Engineering systems (PG/PC) or
- HMI devices (e.g., MP, TP, OP)

PROFIBUS version

- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- Distributed I/Os (SIMATIC ET 200S/M/eco/pro)
- Distributed drives (e.g., SINAMICS S120 Motor Modules with CU320 Control Unit plus SINAMICS S120 Power Modules and CU310 DP Control Unit)
- Engineering systems (PG/PC) or
- HMI devices (e.g., MP, TP, OP)

PC technology

- Processor: Intel® Pentium® M 2 GHz
- Microsoft Windows XP Professional operating system, English
- 512 MB SDRAM, upgradable to 1 GB
- Hard disk with shock damping, approx. 40 GB
- DVD-ROM drive (optional)
- Data backup/restore using the Symantec Ghost data backup software (preinstalled)

■ Integration
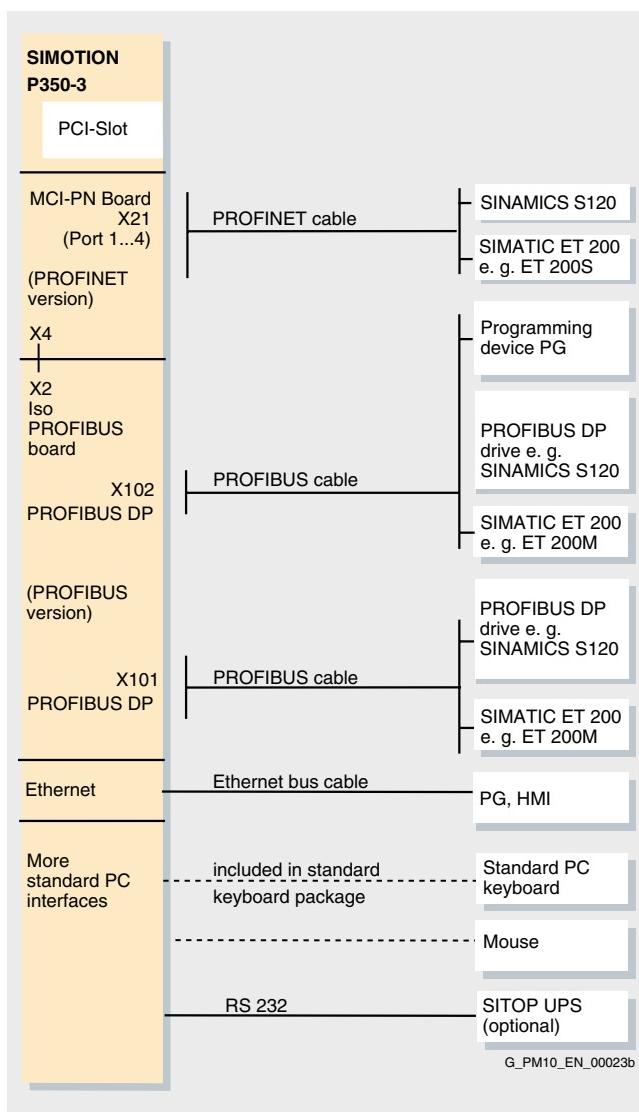
Overview of the SIMOTION P350-3 connections

■ Technical specifications

Input voltage	24 V DC
Power consumption, max.	190 W
Mains buffering	max. 20 ms
Degree of protection EN 60529 (IEC 60529)	IP20
Temperature change, max.	10°K/h
Rel. humidity limit values to IEC 68-2-3, IEC 68-2-30, IEC 68-2-56	
• Storage and transport	5% to 95% at +25 °C (+77 °F)
• Operation	5% to 80% at +25 °C (+77 °F)
Humidity rating in accordance with EN 60721-3-3	Class 3K5 Condensation and icing excluded Low air temperature 0 °C (32 °F)
Permissible ambient temperature	
• Storage and transport	-20 °C to +60 °C (-4 °F to +140 °F)
• Operation	+5 °C to +45 °C (+41 °F to +113 °F)
Weight, approx.	6 kg (13 lb)
Dimensions (W x H x D)	297 mm x 267 mm x 85 mm (11.69 in x 10.51 in x 3.35 in) (excluding DVD drive) 297 mm x 267 mm x 106 mm (11.69 in x 10.51 in x 4.17 in) (including DVD drive)

PROFINET/Industrial Ethernet
SIMOTION Motion Control System

2

SIMOTION P350-3

Ordering data

	Order No.		Order No.
SIMOTION P350-3, PROFIBUS version with Intel Pentium M, 2 GHz, Windows XP Professional 4.0 English, 512 MB SDRAM, 24 V DC, **with IsoPROFIBUS board**		**IE FC TP Standard Cable GP 2x2** 4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/ IE FC RJ45 Plug; PROFINET-compatible; with UL approval; sold by the meter	6XV1 840-2AH10
• without DVD drive	6AU1350-3AK41-1BE2		
• with DVD drive	6AU1350-3AK43-1BE2	**FO Standard Cable GP (50/125)** Standard cable, splittable, UL approval, sold by the meter	6XV1 873-2A
SIMOTION P350-3, PROFINET version with Intel Pentium M, 2 GHz, Windows XP Professional 4.0 English, 512 MB SDRAM, 24 V DC, **with MCI-PN board**		**IE FC RJ45 Plug 180** RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 180° cable outlet; for network components and CPs/ CPUs with Industrial Ethernet interface	
• without DVD drive	6AU1350-3AK41-2BE2		
• with DVD drive	6AU1350-3AK43-2BE2		
Memory expansion		• 1 pack = 1 unit	6GK1 901-1BB10-2AA0
• 128 MB DDR2 533 SODIMM	6ES7648-2AG10-0GA0	• 1 pack = 10 units	6GK1 901-1BB10-2AB0
• 256 MB DDR2 533 SODIMM	6ES7648-2AG20-0GA0	• 1 pack = 50 units	6GK1 901-1BB10-2AE0
• 512 MB DDR2 533 SODIMM	6ES7648-2AG30-0GA0	**SCALANCE X204-2 Industrial Ethernet switch**	6GK5 204-2BB00-2AA3
MCI-PN communication board (for PROFINET upgrade)	6AU1390-0BA00-0AA0	Industrial Ethernet switches with integral SNMP access, online diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; four 10/100 Mbit/s RJ45 ports and two FO ports	
Replacement parts			
• Motherboard battery	6FC5247-0AA18-0AA0		
Runtime software Runtime software licenses can either be pre-installed on a SIMOTION P350-3 or ordered separately. To order pre-installed licenses, simply add the supplementary code onto the end of the SIMOTION P350-3 order number (Z option). For information about ordering runtime software separately (technology and communication functions), see "SIMOTION runtime software".			
Engineering software For information about ordering SIMOTION SCOUT and the CamTool cam editor, see "SIMOTION engineering software".			

More information

Further information on SIMOTION can be found in the online-catalog CA 01 under „Automation systems/SIMOTION Motion Control System".

PROFINET/Industrial Ethernet
SIMOTION Motion Control System

■ Overview

SIMOTION D410 is the SIMOTION D version for single-axis applications. It supplements the D4x5 controller family, which is the solution of choice for multi-axis applications. It is available in both PROFIBUS (D410 DP) and PROFINET (D410 PN) versions.

The SIMOTION D410 motion controller has been specifically designed for use with PM340 SINAMICS Power Modules (blocksize format). It can be connected directly to this series of Power Modules. The SIMOTION D410 can also be installed on a separate mounting plate if required (to be ordered separately).

The D410 handles the motion control, technology and PLC functions associated with a single axis and is also responsible for drive control in respect of that axis. The integrated inputs/outputs support up to 4 rapid cam outputs or 3 probes. The drive control concept supports both servo control (with and without encoder) for a high dynamic response and vector control for maximum torque accuracy.

■ Design

Interfaces

Display and diagnostics
- LEDs for indicating operating states and faults
- 3 measuring sockets

Communication
- 1 x DRIVE-CLiQ
- 2 x PROFINET ports (D410 PN only)
- 1 x PROFIBUS DP (D410 DP only)

Integrated I/Os
- 4 digital inputs
- 4 digital inputs/outputs (max. 4 as cam or 3 as probe)

Additional interfaces
- Terminals for 24 V electronics supply
- 1 x encoder input for HTL/TTL encoder
- PM IF interface (Power Module interface) on rear for direct operation with a SINAMICS S120 Power Module (blocksize format)

Data storage/backup

The SIMOTION D410 has a 24 KB memory for remanent storage of process variables. The runtime software, user data and user programs are backed up on the SIMOTION Compact Flash Card. In the event that the SIMOTION D410 needs to be replaced, the process variables can also be backed up on the SIMOTION Compact Flash Card (CF) by means of system commands.

Connectable I/Os

PROFINET IO: (D410 PN only)
- SIMATIC ET 200S/M/pro distributed I/Os
- HMI

PROFIBUS DP: (D410 DP only)
- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- SIMATIC ET 200S/M/eco/pro distributed I/O systems
- HMI

DRIVE-CLiQ:
- Modules from the SINAMICS range:
  - TM15, TM17 High Feature, TM31, TM41 Terminal Modules (max. 3)
  - SMC/SMI Sensor Modules (max. 2)
  - DMC20 DRIVE-CLiQ hub module (max. 1)
  - CUA31 Control Unit Adapter in conjunction with a Power Module (max. 1)

### *Connection to SINAMICS Power Module*

The SIMOTION D410 motion controller can be connected directly to the SINAMICS Power Module. Alternatively, the D410 can be installed on a separate mounting plate (to be ordered separately) and connected to the Power Module via DRIVE-CLiQ. In this case, the DRIVE-CLiQ adapter module CUA31 has to be connected to the Power Module.

PROFINET/Industrial Ethernet
SIMOTION Motion Control System

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SIMOTION D410

■ **Integration**

SIMOTION
D410 DP/PN

PROFINET[1]	X200 X201	Order No. Pre-assembled cable
		PROFINET cables IRT/RT I/Os
		PROFINET node, e.g. ET 200S
DRIVE-CLiQ	X100	DRIVE-CLiQ cable
		Connection SINAMICS Drive components
EP terminals	X120	Temperature sensor
Onboard I/Os	X121	Digital inputs/ outputs
Power supply	X124	24 V supply
PROFIBUS DP[2]	X21	PROFIBUS DP-node
	X23	HTL/TTL incre-mental encoder
Power Module Interface PM-IF		SINAMICS PM340

G_PM10_EN_00163

[1] SIMOTION D410 PN only
[2] SIMOTION D410 DP only

Overview of SIMOTION D410 connections

The maximum permissible cable lengths should be taken into account when planning the cable layout.

Functional faults can occur when using longer cables.

The permissible length of the PROFIBUS DP cables depends on the configuration.

■ **Technical specifications**

Maximum number of axes	1
Minimum interpolator cycle clock	2.0 ms
RAM (Random Access Memory)	25 MB
RAM disk (load memory)	17 MB
Remanent memory	24 KB
Integrated drive control	1
DRIVE-CLiQ interfaces	1
PROFINET interfaces	1 interface with 2 ports (D410 PN only) • Supports PROFINET IO with IRT and RT • Can be configured as PROFINET IO controller or device
PROFIBUS interfaces	1 (D410 DP only) • Equidistant and isochronous • Can be configured as master or slave
Supply voltage	
• Nominal value	24 V DC
• Permissible range	20.4 V ... 28.8 V

■ **Technical specifications** (continued)

Current consumption, max. (excluding digital outputs and DRIVE-CLiQ supply)	900 mA (digital inputs 10 mA)
Making current, typ.	3.0 A
Power loss	<20 W
Permissible ambient temperature	
• Storage and transport	-40 °C ... +70 °C
• Operation	0 °C ... +55 °C; maximum installation altitude 1000 m above sea level. In the case of a site altitude of over 1000 m, the max. permissible ambient temperature is subject to a reduction of 7 °C per 1000 m.
Permissible relative humidity (without condensation)	5% ... 95%
Degree of protection in acc. with IEC 529	IP20
Dimensions (W x H x D)	75 mm x 183.2 mm x 89.6 mm
Weight	
• SIMOTION D	0.95 kg
• Compact Flash Card	7 g
Digital inputs	**4**
Nominal value	24 V DC
• At "1" signal	15 V ... 30 V
• At "0" signal	-3 V ... +5 V
Electrical isolation	Yes
Current consumption typ. at 1 signal level	10 mA at 24 V
Input delay (hardware)	L->H: approx. 50 µs H->L: approx. 100 µs
Digital inputs/outputs (parameterizable)	**4**
If used as an input	
• Input voltage	
• Nominal value	24 V DC
• At "1" signal	15 V ... 30 V
• At "0" signal	-3 V ... +5 V
• Electrical isolation	No
• Current consumption typ. at 1 signal level	10 mA at 24 V
• Input delay	L->H: approx. 50 µs (5 µs if used as probe) H->L: approx. 100 µs (50 µs if used as probe)
If used as an output	
• Rated load voltage	24 V DC
• Permissible range	20.4 V ... 28.8 V
• Output voltage	
• At "1" signal, max.	15 V ... 30 V
• Electrical isolation	No
• Current load, max.	500 mA per output
• Leakage current, max.	2 mA
• Short-circuit protection	Yes
cULus approval	http://www.ul.com File E164110

PROFINET/Industrial Ethernet
SIMOTION Motion Control System

SIMOTION D410

Ordering data	Order No.
SIMOTION D410 DP	**6AU1410-0AA00-0AA0**
SIMOTION D410 PN	**6AU1410-0AB00-0AA0**
Backplane mounting plate For installing the SIMOTION D410 in a different location, if you do not wish to connect it directly to the Power Module.	**6AU1400-7AA05-0AA0**
SIMOTION Compact Flash Card (CF) 512 MB with SIMOTION Kernel and the latest SINAMICS drive runtime software	**6AU1400-2NA00-0AA0**
IE FC TP Standard Cable GP 2x2 4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/ IE FC RJ45 Plug; PROFINET-compatible; with UL approval; sold by the meter	**6XV1 840-2AH10**
FO Standard Cable GP (50/125) Standard cable, splittable, UL approval, sold by the meter	**6XV1 873-2A**
IE FC RJ45 Plug 180 RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 180° cable outlet; for network components and CPs/ CPUs with Industrial Ethernet interface	
• 1 pack = 1 unit	**6GK1 901-1BB10-2AA0**
• 1 pack = 10 units	**6GK1 901-1BB10-2AB0**
• 1 pack = 50 units	**6GK1 901-1BB10-2AE0**
SCALANCE X204-2 Industrial Ethernet switch Industrial Ethernet switches with integral SNMP access, online diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; four 10/100 Mbit/s RJ45 ports and two FO ports	**6GK5 204-2BB00-2AA3**

More information

Further information

• on ordering other SINAMICS drive components such as Line Modules, Motor Modules, DRIVE-CLiQ cables, etc., refer to the interactive catalog CA 01, which is available at "Drive Technology/AC converters/…" or to the Catalog D21.1, SINAMICS S120:

2

NCU 730.2 PN

Overview

The NCU 730.2 PN is the new flagship of the SINUMERIK 840D sl and, with a significantly higher PLC capacity than an NCU 730.1, represents the most advanced configuration within the SINUMERIK 840D sl range. The NCU 730.2 PN is the first NCU to offer integrated PROFINET interfaces with PROFINET IO and PROFINET CBA.

Up to 31 axes are available in up to 10 machining channels which can be executed in up to 10 mode groups. Up to 12 axes/spindles are supported per channel. Interpolation is possible for a maximum of 12 axes with the NCU system software (multi-axis interpolation option).

The basic version of the CNC user memory is 3 MB, and can be optionally expanded up to 15 MB.

Integration

The following components can be connected to the SINUMERIK 840D sl:

- SINUMERIK operator panel front with TCU, PCU 50.3 and machine control panel, Push Button Panel
- SIMATIC CE panel
- SINUMERIK handheld units
- Distributed PLC I/O via PROFIBUS DP connection or PROFINET IO
- SINAMICS S120 drive system
- Feed and main spindle motors

■ Technical specifications

Order No.	6FC5371-0AA10-0AA0	6FC5372-0AA00-0AA0	6FC5373-0AA00-0AA0	6FC5373-0AA01-0AA1
Product name	SINUMERIK 840D sl; NCU 710.1 with PLC 317-2DP	SINUMERIK 840D sl; NCU 720.1 with PLC 317-2DP	SINUMERIK 840D sl; NCU 730.1 with PLC 317-2DP	SINUMERIK 840D sl; NCU 730.2 PN with PLC 319-3PN/DP
Processor	Intel Celeron D	Intel Pentium 4M	Intel Pentium M	
• Clock frequency	1.2 GHz	1.7 GHz	2 GHz	2 GHz
RAM	512 MB DRAM; 0.5 MB SRAM		512 MB DRAM; 1 MB SRAM	512 MB DRAM; 1 MB SRAM
SIMATIC S7 - integrated	PLC 317-2DP			PLC 319-3PN/DP
Input voltage	24 V			
Degree of protection to EN 60529 (IEC 60529)	IP20			
Humidity rating in accordance with EN 60721-3-3	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).			
Relative humidity				
• Storage	10 ... 95%			
• Transport	10 ... 95%			
• Operation	≤ 85% for max. 2 months			
Ambient temperature				
• Storage	-25 ... 55 °C (-13 ... +131 °F)			
• Transport	-40 ... +70 °C (-40 ... +158 °F)			
• Operation	0 … 55 °C (32 ... 131 °F)			
Dimensions				
• Width	50 mm (1.97 in)			
• Height	418 mm (16.5 in)			
• Depth	272 mm (10.7 in)			
Approx. weight	3.6 kg (7.94 lb)			

■ More information

Further information

• on ordering data for SINUMERIK components refer to the interactive catalog CA 01 or to Catalog NC 61, SINUMERIK & SINAMICS.

PROFINET/Industrial Ethernet
ET 200pro – RFID Systems

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SIMATIC RF180C

Overview

The SIMATIC RF180C is a communication module for direct connection of Siemens RFID systems to PROFINET IO. The readers (SLGs) of the RFID systems MOBY D, U and RF300 can be operated on SIMATIC RF180C.

Due to the high degree of protection and its ruggedness, SIMATIC RF180C is ideally suited to use at machine level. The uniform plug-in connection system ensures rapid commissioning.

Benefits

- Two parallel MOBY channels ensure real-time operation of the dynamic read points
- Reader connection with an 8-pole M12 connector for rapid assembly of all components
- Easy changeover from PROFIBUS applications to PROFINET with SIMATIC RF180C thanks to software compatibility
- The integrated switch allows several PROFINET modules to be installed in star or bus topology. Each application can then be built up quickly and inexpensively
- Powerful hardware ensures rapid data communication with the reader (SLG). So that the data are available to the application more quickly
- Simple firmware downloading in the case of function expansions and error rectification ensures high availability of the RFID system
- Adjustable and parameterizable RFID-specific diagnostics facilitate commissioning and troubleshooting
- A broad selection of pre-assembled connecting cables can be ordered for connecting PROFINET and readers to SIMATIC RF180C. This saves time and money during installation and increases the quality
- The hardware configuration with a base unit and connection block ensures that SIMATIC RF180C is prepared for other connection techniques, such as fiber-optic cables

Application

The PROFINET communication module SIMATIC RF180C has been specially designed for a wide range of applications in industrial automation and logistics. Due to the high degree of protection IP67, SIMATIC RF180C can be installed in the process outside the control cabinet.

Main applications for SIMATIC RF180C:

- Machine manufacturing, automation systems, conveyor systems
- Ancilliary assembly lines in the automotive industry / suppliers
- Small assembly lines

Design

PROFINET IO
master module
e.g. S7-400 with CP 443-1

PROFINET

24 V for
RF180C and Reader

to other
PROFINET IO
participants

2. Reader   1. Reader

Tag / MDS

G_FS10_XX_00228
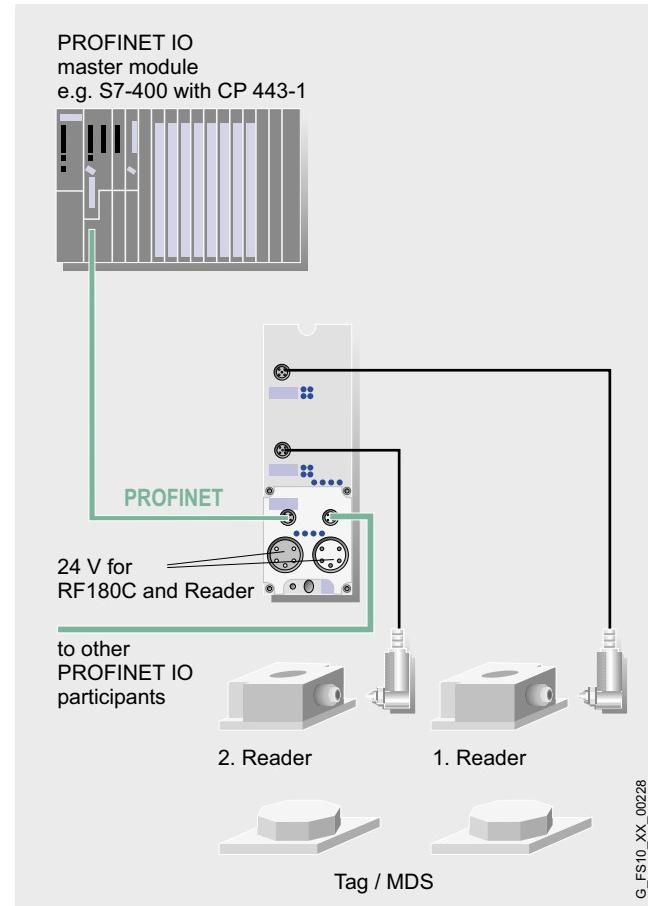
Function

The SIMATIC RF180C comprises a basic module and a connection block that must be ordered separately.

The connection block is available in the version M12, 7/8''. PROFINET is connected through an M12 plug, whereas the supply voltage is connected through a 7/8'' plug. There are 2 connections for PROFINET as well as for the power supply. This ensures that SIMATIC RF180C can be connected to additional bus stations without the need for external distribution devices. The removable connection block allows a base module to be replaced without interrupting the supply voltage to other bus stations.

SIMATIC RF180C is integrated in SIMATIC STEP 7 via the GSDML file. SIMATIC RF180C can then be configured via the SW tool HW_Config of SIMATIC Manager or another PROFINET tool.

A pre-assembled reader cable is used to connect one or two readers to the communication module. The standard cable length is 2 m. If other reader cable lengths are required, an extension cable from 2 to 50 m in length can be used. The cable can also be assembled by the customer as required.

The data in the transponder can be accessed in the following manner: Direct addressing via absolute addresses

Error messages and operating states (tag in field, transfer, etc.) are also displayed on LEDs and support commissioning and service.

SIMATIC RF180C has two reader interfaces from which the readers are also supplied with voltage. There is a solid-state fuse in SIMATIC RF180C for the reader power supply. The maximum current permitted for the readers per SIMATIC RF180C is 1 A. It is not important here whether the current is drawn by 1 or 2 readers.

The application accesses the tag via FB45. FB45 accesses the tag via absolute addresses. For large volumes of data and complex tag operations, the FB45 can process chained commands.

Data is exchanged between SIMATIC RF180C and the application by means of acyclic data records. This ensures that a large quantity of data can be transferred from/to SIMATIC RF180C without loading the bus cycle. This is advantageous when large volumes of data are being transferred. SIMATIC RF180C can also process chained tag commands in this mode extremely quickly.

Technical specifications

Supply voltage	
• Rated value	24 V DC
• Permissible range	20 to 30 V DC
Current consumption	
• Without reader, typ.	100 mA
• With two readers, max.	1000 mA
Serial reader interface (gross transmission rate)	
• MOBY I/E	19200 bit/s
• MOBY U/D, RF300	19200, 57600, 115200 bit/s
Cable connector	2 x connector plug M12, 7-pin
Cable lengths to the reader	
• Standard lengths	2 m
• Optional pre-assembled cable	5 m, 10 m, 20 m, 50 m
Self-assembled cable	Reader/SLG-dependent. Up to 1000 m
Supply voltage to the reader	24 V
Max. current per reader	
• 2 readers connected	0.5 A
• 1 reader connected	1.0 A
Ambient temperature	
• During operation	-0 ... 60 °C
• During storage	-40 ... +70 °C, 20 K/h
Shock load during operation acc. to IEC 61131-2	30 g
Vibratory load during operation acc. to IEC 61131-2	0.75 mm (10 Hz to 58 Hz) 10 g (58 Hz to 150 Hz)
Housing	
• Material	Thermoplastic (fiberglass reinforced)
• Color	IP Basic 714
• Degree of protection	IP67
Dimensions (W x H x D) in mm	
• SIMATIC RF180C without connection block	60 x 210 x 30
• SIMATIC RF180C with connection block	60 x 210 x 54
Weight	
• Base module only	210 g
• Connection block only	230 g

PROFINET/Industrial Ethernet
ET 200pro – RFID Systems

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Ordering data	Order No.
SIMATIC RF180C communication module For PROFINET, for connecting 2 readers; without a connection block	**6GT2 002-0JD00**
Accessories for MOBY	
Connection block for SIMATIC RF180C for connecting 2 readers over an M12 cable connector	**6GT2 002-1JD00**
SLG cable for MOBY I/E/U 2 m	**6GT2 091-0FH20**
SLG cable for MOBY I/E/U 5 m	**6GT2 091-0FH50**
SLG cable for MOBY D 2 m	**6GT2 691-0FH20**
SLG cable for RF300 **Extension cable for MOBY** I/E/U/D/RF300; 2 m	**6GT2 891-0FH20**
SLG cable for RF300 **Extension cable for MOBY** I/E/U/D/RF300; 5 m	**6GT2 891-0FH50**
SLG cable for RF300 **Extension cable for MOBY** I/E/U/D/RF300; 10 m	**6GT2 891-0FN10**
SLG cable for RF300 **Extension cable for MOBY** I/E/U/D/RF300; 20 m	**6GT2 891-0FN20**
SLG cable for RF300 **Extension cable for MOBY** I/E/U/D/RF300; 50 m	**6GT2 891-0FN50**
M12 sealing caps for unused reader connections (10 units)	**3RX9 802-0AA00**
Industrial Ethernet switches SCALANCE X-200 Industrial Ethernet switches with integral SNMP access, online diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies	
• SCALANCE X208PRO with eight 10/100 Mbit/s M12 ports, incl. eleven M12 dust protection caps, IP65 degree of protection	**6GK5 208-0HA00-2AA6**

	Order No.
Accessories for connection to the network	
PROFINET cable with M12 plugs, pre-assembled for trailing	**6XV1 870-8Axxx** [1]
Cable for supply voltage pre-assembled with 7/8" plugs	**6XV1 822-5Bxxx** [1]
PROFINET standard cable 2x2 Type A, not pre-assembled; minimum order quantity 20 m	**6XV1840-2AH10**
PROFINET M12 plug connector rugged metal housing; fast connect system; D-coded (pack of 1)	**6GK1901-0DB10-6AA0**
7/8" cable connector for voltage (pack of 5)	
• With male insert	**6GK1 905-0FA00**
• With female insert	**6GK1 905-0FB00**
IE M12 cabinet bushing for conversion from M12 (D-coded) to RJ45; (pack of 5)	**6GK1901-0DM20-2AA5**
IE FC RJ45 PLUG 180 RJ45 plug connector with rugged metal housing and FC connection system; straight cable outlet (pack of 1)	**6GK1901-1BB10-2AA0**

[1] This cable is available in different lengths (see Catalog IK PI · 2007 or in the Internet under: http://www.siemens.com/automation/mall)